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THE OBJECTIVES OF THE OFF-POST INTERIM RESPONSE ACTION ARE TO:
1. CONTINUE GROUND WATER MONITORING AND PROVIDE AN ALTERNATIVE DRINKING WATER SUPPLY
2. MITIGATE MIGRATION OF CONTAMINANTS IN ALLUVIAL GROUND WATER
3. TREAT CONTAMINATED ALLUVIAL GROUND WATER.

THIS FINAL DECISION DOCUMENT PROVIDES SUMMARIES OF:
1. ALTERNATIVES CONSIDERED
2. SIGNIFICANT EVENTS LEADING TO THE INITIATION OF THE IRA
3. THE IRA PROJECT
4. THE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS, STANDARDS, CRITERIA, AND LIMITATIONS (ARAR'S) ASSOCIATED WITH THE PROJECT.

THE SELECTED IRA PROGRAM WILL CONSIST OF:
1. CONTINUED MONITORING
2. GROUND WATER EXTRACTION AND RECHARGE, BUT NO PHYSICAL BARRIER

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FINAL DECISION DOCUMENT

FOR THE

GROUND-WATER INTERCEPT AND TREATMENT SYSTEM NORTH OF ROCKY MOUNTAIN ARSENAL

INTERIM RESPONSE ACTION

July 1989

Prepared for:

U.S. ARMY PROGRAM MANAGER'S OFFICE FOR

ROCKY MOUNTAIN ARESENAL CONTAMINATION CLEANUP

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1.0 INTRODUCTION

The Interim Response Action (IRA) for the Ground-Water Intercept and Treatment System North of Rocky Mountain Arsenal (RMA) is being conducted as part of the IRA Process for RMA in accordance with the June 5, 1987, report to the court in United States v. Shell Oil Co. (Shell) and the Federal Facility Agreement effective February 17, 1989.

This IRA project consists of the design and construction of an alluvial ground-water intercept and treatment system north of RMA. The Army will also continue its current ground-water monitoring program and its ongoing evaluation of the need for, and provision of, alternate water supplies. The Army committed to the construction of this IRA in a letter to the Colorado Department of Health dated August 12, 1988.

2.0 BACKGROUND

RMA is located northeast of Denver in Adams County, Colorado, as shown in Figure 1-1. RMA was established in 1942 as a facility for the manufacture of chemical munitions. From the 1940s to the early 1980s, the site was used for chemical manufacturing and demilitarization of munitions. Industrial and waste disposal practices of both the Army and lessees during that time have resulted in soil, surface-water and ground-water contamination both onpost and offpost. As a result, the RMA site was added to the National Priorities List (NPL) in 1987 and is subject to compliance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA).

Investigations were initiated at RMA to identify potential areas of onpost soil contamination, probable contaminant migration pathways, and areas of ground-water contamination. Those investigations indicated historical migration of contaminants to offpost areas. Based on the results of these investigations, three onpost ground-water interception, treatment, and recharge systems were designed and installed to prevent the migration of contaminated ground water to offpost areas. These systems inhibit the migration of RMA contaminants along the northern, northwestern, and western boundaries of RMA and together treat and recharge approximately one billion gallons of ground water annually. The Final Remedial Investigation (RI) Report (ESE, 1988a) identified chemical plumes offpost to the north and northwest. This IRA addresses contaminant migration to the north of RMA along both the First Creek and Northern Paleochannels.

2.1 DESCRIPTION OF OFFPOST IRA STUDY AREA

The IRA study area extends from the northern boundary of RMA to O'Brian Canal, as shown on Figure 1-2. This area encompasses approximately four square miles. First Creek is an ephemeral stream that flows across RMA and the IRA study area to O'Brian Canal. There are no other major surface-water courses within the study area.

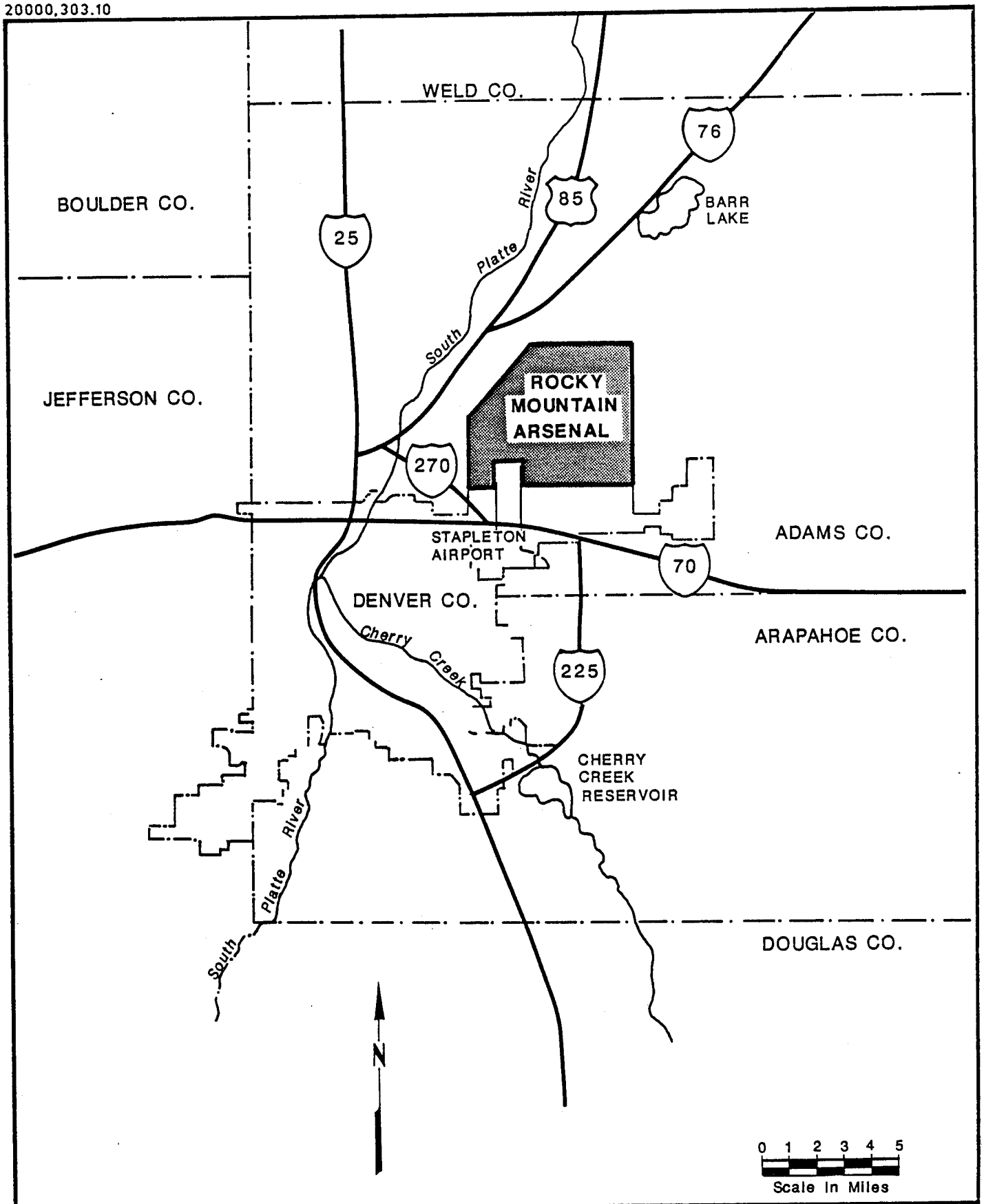

Figure 1-1
LOCATION MAP OF
ROCKY MOUNTAIN ARSENAL

Prepared for:
U.S. Army Program Manager's Office
For Rocky Mountain Arsenal
Aberdeen Proving Ground, Maryland

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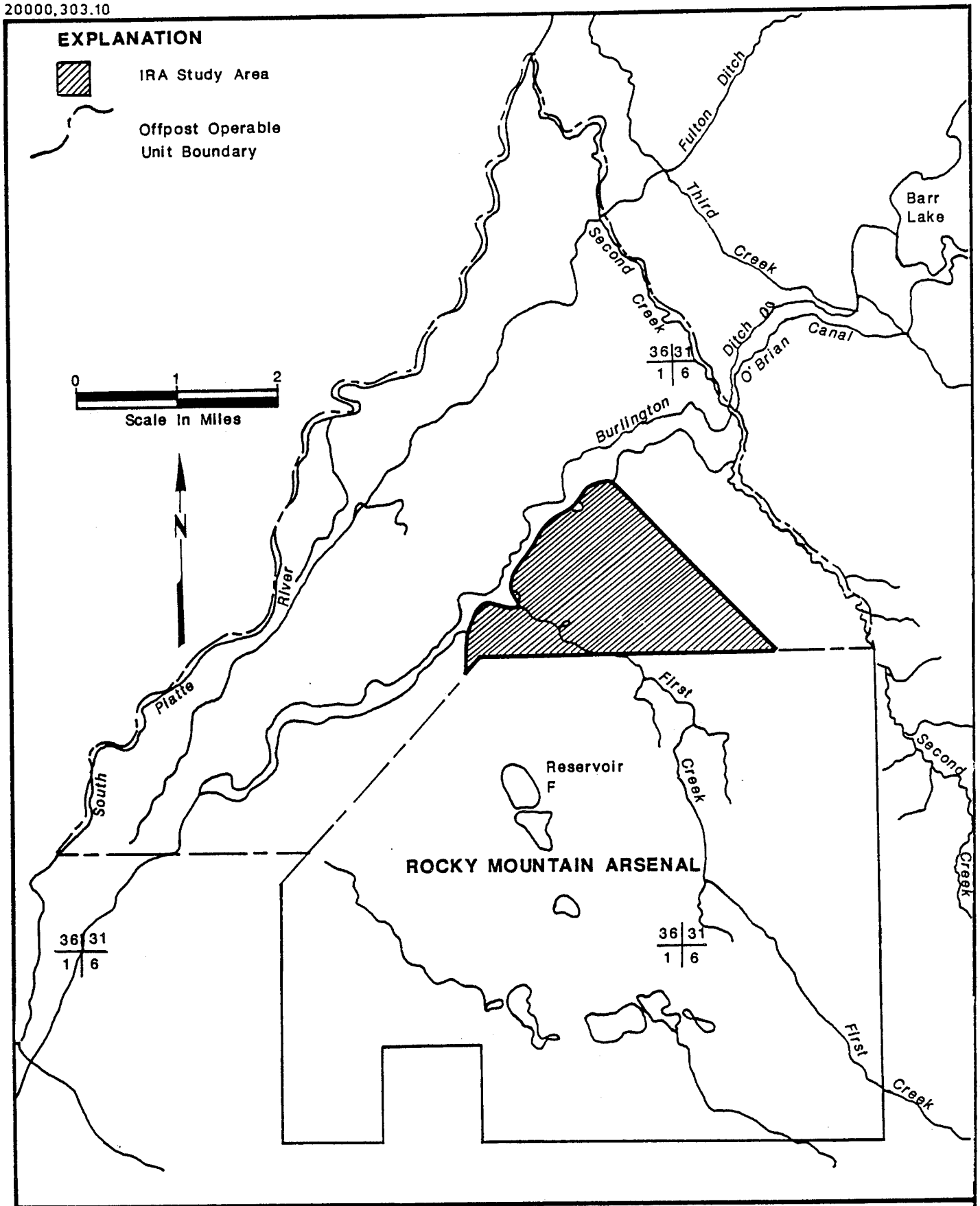

Figure 1-2
IRA STUDY AREA

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Aberdeen Proving Ground, Maryland

The delineation of this area as the IRA study area is based on: (1) conclusions contained in the RI report regarding the offpost migration of contaminants and (2) the interim response objectives of the IRA, as discussed in Section 3.0. The results of the RI have shown that:

1. The First Creek and Northern Paleochannels are the primary pathways for offpost migration of contaminants north of the RMA boundary.
2. The highest concentrations of contaminants in the alluvial ground water offpost occurs along these two pathways upgradient of Burlington Ditch and O'Brian Canal.
3. The greatest flux of contaminants to downgradient areas generally occurs along the axes of the paleochannels, where the saturated thickness of the alluvium is greatest and the contaminant concentrations are highest.

Based on these findings and the IRA objective of initiating ground-water remediation in a timely manner to mitigate further downgradient migration of contaminated ground water, the IRA study area has been established to include offpost contaminant plumes occurring along the First Creek and Northern Paleochannels.

2.1.1 Geology

RMA is located on the northern flank of the Denver Basin, an elongated north-south trending asymmetric syncline approximately 300 miles long and 200 miles wide. Denver Basin formations relevant to the study area are the Arapahoe Formation (older) and the Denver Formation (younger). The primary focus of studies to date has been the unconsolidated Quaternary surficial deposits, known collectively as "alluvium," and the Denver Formation, which is the shallowest bedrock formation within the study area. There has been no evidence of Arapahoe Formation contamination associated with RMA; therefore, the Arapahoe Formation is not considered further.

Alluvium

Unconsolidated alluvial and eolian sediments cover most of the IRA study area. During Quaternary time, the surface of the Denver Formation was severely eroded by paleostreams tributary to the ancestral South Platte River. The stratigraphic thickness of the Denver Forma-

tion was progressively reduced toward the northwest, and paleochannels were incised into the bedrock surface. Over time, these channels were filled with coarse-grained sediments. Later events such as the formation of terraces by the South Platte River and the blanketing of the area by eolian deposits further influenced the local geology.

The alluvial units of concern in the study area are the Broadway Alluvium, eolian sand and loess units, and the Piney Creek Alluvium. The coarse Broadway Alluvium is from 0 to 30 feet thick and forms a low, mile-wide terrace east of the South Platte River flood plain. Overlying the Broadway Alluvium are silty loess and eolian sand deposits that blanket most of the interfluvial areas in the study area. These deposits are generally less than 20 feet thick. The Piney Creek Alluvium is the youngest unit in the study area and was deposited by a tributary of the South Platte River. These fluvial deposits are generally less than five feet thick and are present within the study area only in the First Creek channel area.

Denver Formation

The Denver Formation immediately underlies the alluvium at depths ranging from 20 to 50 feet. This formation was deposited in low-energy environments that gave rise to claystones, siltstones, shales, lignites (coals), and sandstones. Denver Formation sandstones are commonly discontinuous, poorly cemented, lenticular (channel-like), and poorly interconnected. They are commonly silty and are generally isolated from each other by thick sequences of clay-shale and siltstone. The thin, tabular, crevasse-splay sand bodies tend to be more areally extensive but cannot be correlated over large areas. Units comprising the Denver Formation strike northeast and dip southeast at less than one degree. Hence, there is a low-angle unconformable relationship between the Denver Formation and the alluvium that results in Denver Formation units subcropping against alluvial units.

The topography of the bedrock surface (Figure 2-1) shows evidence of extensive erosion of the Denver Formation prior to alluvial deposition. This is evident in the northwestward slope of the bedrock surface and the presence of three paleochannels in the study area. The easternmost

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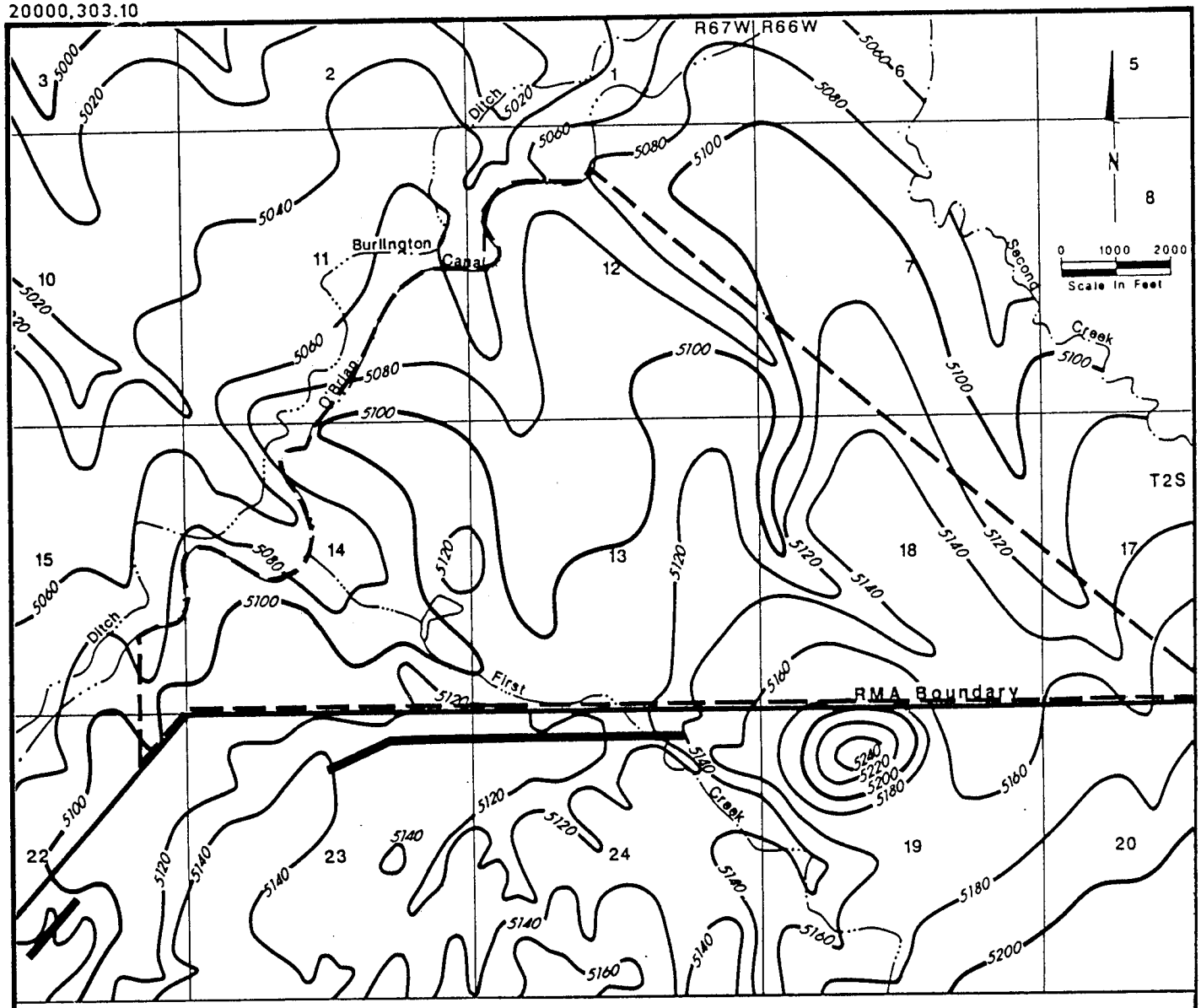

EXPLANATION

- Boundary Containment System
- IRA Study Area Boundary
- RMA Boundary
- 5120 — Bedrock Surface Elevation (Feet above MSL) Contour Interval=20 feet

Figure 2-1
GENERALIZED BEDROCK SURFACE ELEVATION CONTOUR MAP

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Aberdeen Proving Ground, Maryland

of these paleochannels in Sections 7, 12, and 18 exerts no apparent influence on contaminant migration and is therefore not of concern. The other two paleochannels, however, correspond to two preferred migration routes for contaminants leaving RMA. The Northern Paleochannel is believed to have been formed by headward (southward) erosion of the bedrock surface within a northerly draining paleostream. The Northern Paleochannel begins in southwestern Section 13 and trends north-northwest through the study area. The First Creek paleochannel enters the study area in southwestern Section 13/southeastern Section 14 and trends northwest through Section 14. Whether the two channels join in southwestern Section 13 has not been determined.

2.1.2 Hydrology

Ground water in the study area occurs in Quaternary alluvium and in water-bearing units of the Denver Formation. The Denver Formation and the overlying alluvium comprise the shallow ground-water system within which chemical contamination related to RMA has been identified. The bulk of ground-water flow and ground-water contamination is observed to occur within the alluvium.

Ground water in alluvial materials within the study area is characterized by unconfined flow conditions and a north to northwest flow direction. This is consistent with the regional flow direction toward the South Platte river, which is the regional discharge point for both ground-water and surface-water regimes.

The hydraulic gradient of the water-table surface ranges from .002 to .022 in a northwesterly direction. The water table in some areas drops below the bedrock surface, leaving the alluvium unsaturated. Such areas of unsaturated alluvium are present in eastern Section 13 and south of First Creek and north of First Creek in Section 14 (Figure 2-2). Unconfined ground-water flow in these areas occurs within the upper Denver Formation. The greatest alluvial thickness and saturated thickness occur in the vicinity of the First Creek Paleochannel and the Northern Paleochannel and decrease near subsurface bedrock highs.

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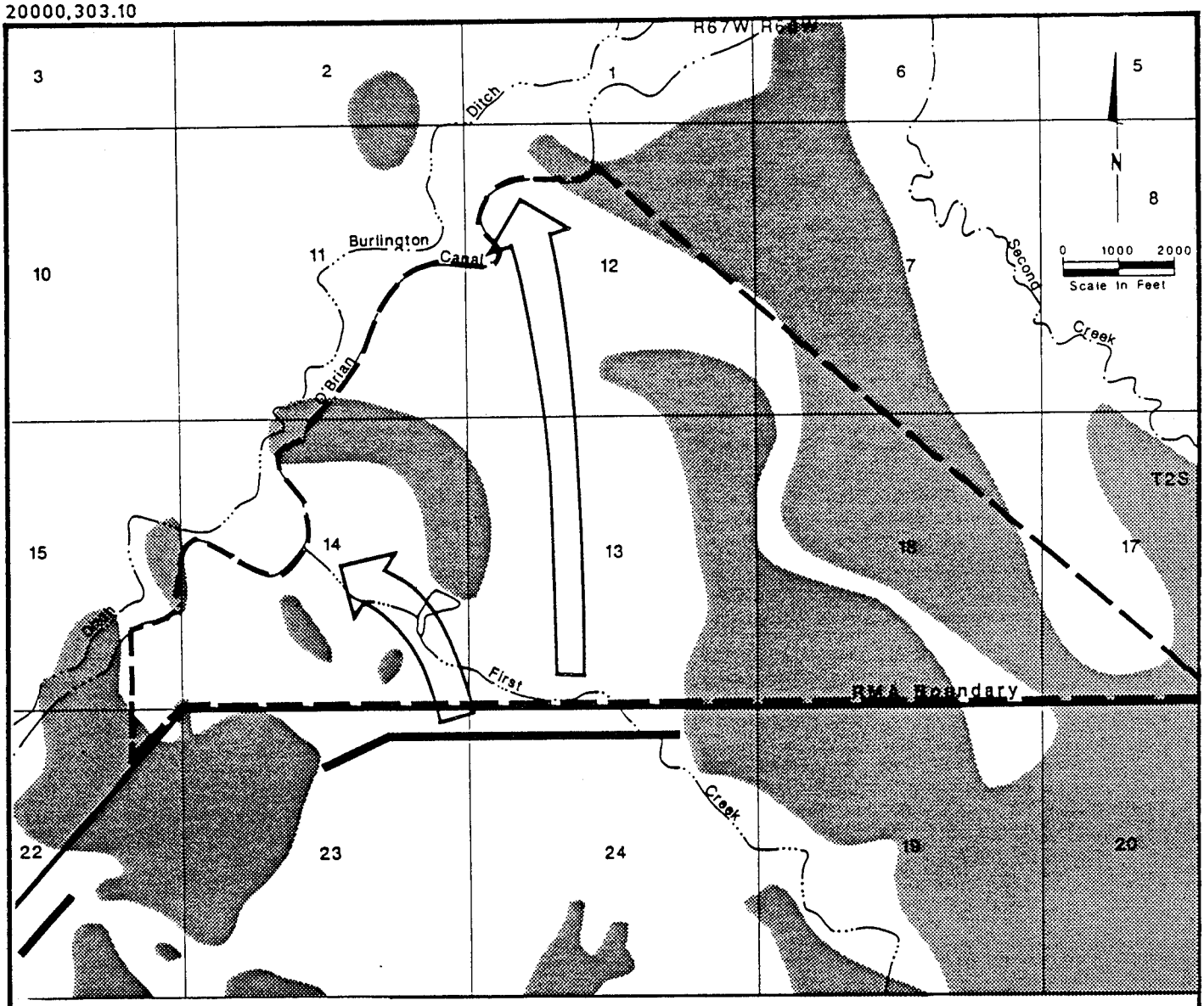

EXPLANATION

- Boundary Containment System
- RMA Boundary
- IRA Study Area Boundary
- Area Of Unsaturated Alluvium
- Primary Ground-Water Flow Path

Figure 2-2
UNSATURATED ALLUVIUM AND PRIMARY FLOW PATHS IN VICINITY OF IRA STUDY AREA

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Aberdeen Proving Ground, Maryland

The saturated zone generally includes basal sands and sandy gravels as well as overlying clays and silty clays. About 55 to 60 percent of the saturated, unconsolidated sediments are sand and gravel, and 40 to 45 percent are silt and clay. The coarser alluvial sediments are more significant because of their higher hydraulic conductivity compared to finer-grained sediments.

In the study area, the saturated region is bounded by several areas of unsaturated alluvium (Figure 2-2). These areas occur near bedrock highs, which are located along the east edge of Section 13 into Section 12, along the west edge of Section 13 and the east edge of Section 14, and south of First Creek in Section 14. In areas of unsaturated alluvium, the water table is in the upper Denver Formation. Pumping and slug test data from the alluvium and the Denver Formation indicate that hydraulic conductivities in Denver Formation aquifers are approximately two orders of magnitude lower than alluvial hydraulic conductivities. Therefore, shallow ground water flowing through the study area will tend to preferentially flow through saturated alluvium and around areas of unsaturated alluvium. Because saturated alluvial thickness and hydraulic conductivity are greater in the paleochannels, the flux of ground water flowing through these pathways is large compared to that in bedrock high areas. Ground water and associated contamination tend to follow these pathways, as confirmed by the distribution of contaminants (ESE, 1988a and 1988b). Figure 2.3 is a generalized compilation of contaminant distributions and is based on plume maps contained in the RI report (ESE, 1988a).

Alluvial/Denver Formation Interactions

The potential for vertical ground-water movement between the alluvium and the Denver Formation was assessed by evaluating the differences in water elevations between wells at cluster sites. Downward gradients were indicated at sites where there were no subcropping Denver Formation sands, whereas an upward hydraulic gradient was indicated where there was a subcropping Denver Formation sand. This is consistent with more extensive data from the RMA Draft Final Water RI Report (ESE, 1988b). These observations indicate that there is a potential for (1) downward ground-water movement in areas of Denver Formation aquitard subcrop and

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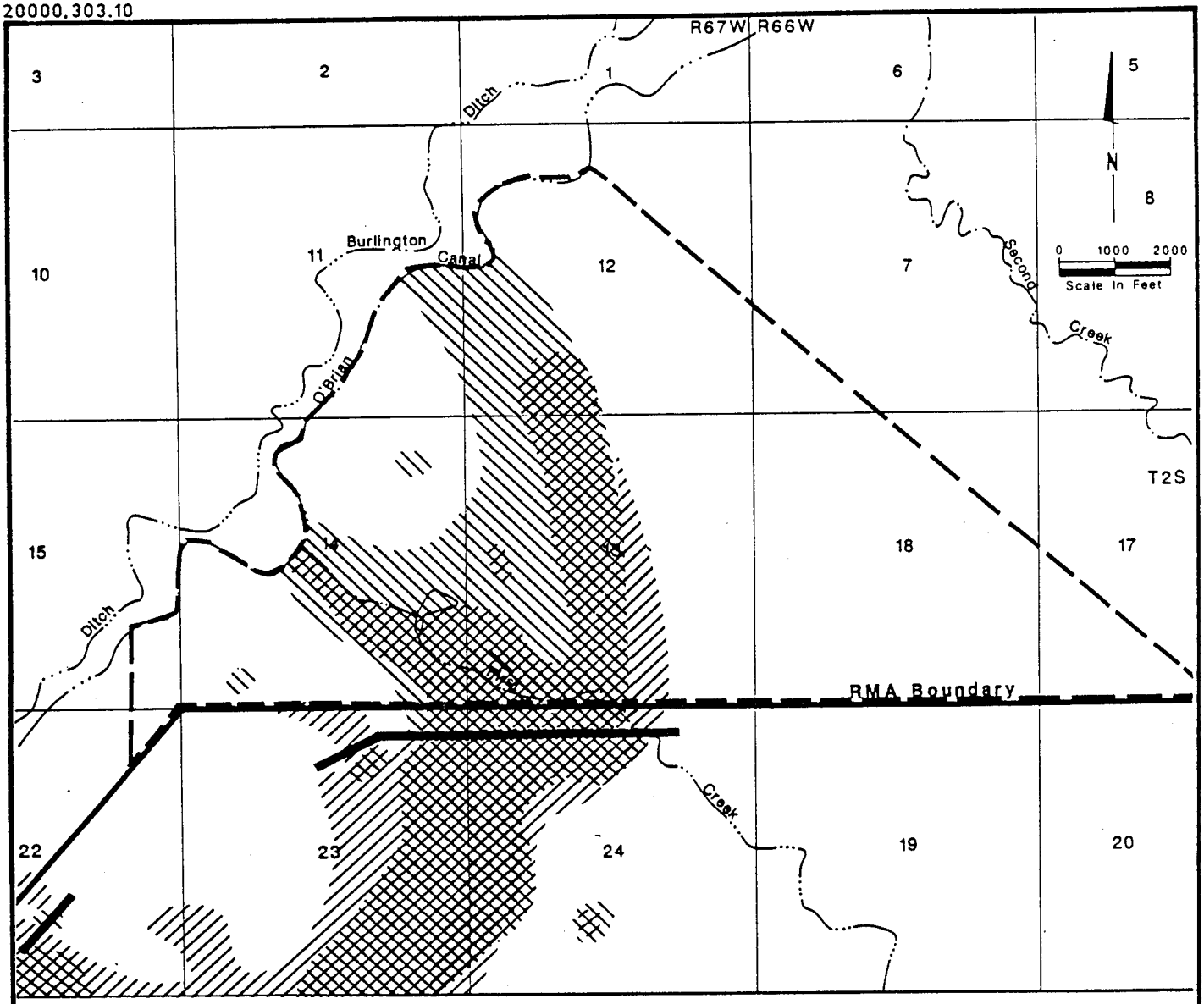

EXPLANATION

- Boundary Containment System
- RMA Boundary
- IRA Study Area Boundary
- Area of Volatile Organic Compounds and DBCP (Benzene, CCL4, DBCP, TCE, TCLEE)
- Area of Pesticides (Aldrin, Dieldrin, Endrin)

Reference : Draft Offpost RI Report (ESE, 1988)

Figure 2-3
MAXIMUM EXTENT OF SELECTED CONTAMINANTS IN THE ALLUVIAL AQUIFER WITHIN THE IRA STUDY AREA

Prepared for:
U.S. Army Program Manager's Office For Rocky Mountain Arsenal
Aberdeen Proving Ground, Maryland

(2) upward ground-water movement in areas of Denver Formation sand subcrop. As indicated in the Draft Water RI Report, the vertical hydraulic conductivity in Denver Formation aquitards is sufficiently low as to preclude extensive, rapid, downward ground-water movement. Indications are that contamination in the upper Denver Formation is the result of either enhanced vertical fracturing or poorly constructed wells. In areas where Denver Formation aquifers subcrop against alluvium, upward vertical flow occurs. However, because Denver Formation aquifers are not as permeable as alluvium, the flow contribution from the Denver Formation is considered small compared to the horizontal flow occurring in the alluvium.

2.1.3 Surface Water

Surface-water bodies within the study area include First Creek (Sections 13 and 14), a man-made pond located along the creek in southeast Section 14, and O'Brian Canal and Burlington Ditch along the northwest boundary of the area. Flow in First Creek enters the study area at the northern RMA boundary and flows northwest until it is intercepted by O'Brian Canal. From there, O'Brian Canal flows northeast, supplying water to several irrigation ditches downstream. When surplus water exists, the water from the canal flows downgradient and is stored in Barr Lake to the northeast. First Creek may receive flow by direct overland flow from RMA or by recharge to the channel from alluvial ground water.

Natural flows in First Creek are intermittent. Flow in the stream diminishes as it crosses RMA, and the channel disappears northwest of O'Brian Canal. First Creek flows are diverted entirely by O'Brian Canal and range from a minimum of no flow to calculated maximum flows of 164 cubic feet per second (cfs) and 5350 cfs for 2-year and 100-year flood stages, respectively. Maximum flows in O'Brian Canal may reach 950 cfs, and Burlington Ditch maximum flows may reach 200 cfs. These canals are designed to accept natural flows during near normal flow periods, but they could not accept very high flows such as those projected from First Creek during 100-year flood events. If flows in First Creek exceed the capacity of O'Brian Canal, they

will be diverted and then discharged to the ground surface on the northwest side of O'Brian Canal.

2.1.4 Ground-Water/Surface-Water Interactions

Ground-water/surface-water interactions in the vicinity of RMA have been evaluated using a water budget approach with the basic premise that inflow minus outflow equals the change in storage for a surface-water course or lake. At present, qualitative observations of the First Creek channel in the vicinity of the North Boundary Containment System (NBCS) can be used to draw some preliminary conclusions regarding the interactions between surface water and ground water. First, there appears to be significant interaction between ground water and First Creek, indicated by changes in flows at various points along the drainage course. Second, the marshy conditions near the North Bog and at the confluence of First Creek and O'Brian Canal indicate significant ground-water/surface-water interaction in these areas.

The water table near the North Bog and at the confluence of First Creek and O'Brian Canal is very near ground surface. In the area of First Creek and O'Brian Canal, this condition likely results from ground-water discharges (discussed below). In the area of the North Bog, marshy conditions result from artificial recharge of water released from the NBCS treatment system, which causes mounding of the alluvial water table.

As First Creek traverses the onpost area, it appears to be contributing a portion of its flow to ground water and thus behaves as a losing stream. The opposite behavior is apparent north of RMA, where it appears that the stream is gaining from ground water, resulting in more consistent flows in this northern segment than those observed to the south. In the area of the confluence of First Creek and O'Brian Canal, marshy conditions indicate significant ground-water/surface-water interaction.

2.2 GROUND-WATER CONTAMINATION

Chemical contamination originating at RMA has migrated to the study area principally through the alluvial ground-water system and presently exists in two main plumes (Figure 2-3).

The first plume (the Northern Plume) begins in southwest Section 13 and southeast Section 14 and from there trends northward, reaching the O'Brian Canal in western Section 12. The second plume (the First Creek Plume) also begins in southern Sections 13 and 14 but trends northwestward along First Creek, reaching O'Brian Canal in central Section 14. Chemical evidence (ESE, 1988a) suggests that the plumes continue northward and northwestward past O'Brian Canal, but chemical concentrations past this feature are greatly reduced. The width of the northern plume, as defined by chemical detection limits, is approximately 2500 feet, and the width of the First Creek plume is approximately 800 feet to 3000 feet, depending on the compound under consideration. A more complete description of the extent of ground-water contamination in the offpost area is presented in the RI Report for the Offpost OU (ESE, 1988a) and the Water RI Report (ESE, 1988b).

2.3 CHEMICALS PRESENT

The chemicals detected in the two plumes within the study area are as follows:

- Chlorinated pesticides - aldrin, dieldrin, endrin, isodrin, p,p'DDE, p,p'DDT
- DBCP (dibromochloropropane)
- DCPD (dicyclopentadiene)
- DIMP (diisopropylmethylphosphonate)
- Organophosphorous pesticides
- pCPMS-SO-SO_2 (pChlorophenylmethyl sulfide, sulfoxide, and sulfone)
- Dithiane - oxathiane
- Purgeable organohalogens - chlorinated methanes, ethanes, and ethylenes
- Purgeable aromatics - including aromatic hydrocarbons, benzene, toluene, xylenes, and ethyl benzene
- Arsenic
- Mercury
- Base metals - including cadmium, chromium, copper, lead, and zinc

The chemicals listed above are present in either the First Creek Plume or the Northern Plume, or in both plumes. In the First Creek Plume, the apparent center of mass for most contaminants is within 500 feet of First Creek. Hence, the axis along which the highest chemical concentrations were detected corresponds approximately to the course of First Creek. The apparent center of mass of the Northern Plume for most compounds is approximately 1000 feet east of the section line in Section 13 and turns northwestward in Section 12. Within each plume, concentrations of the various chemical constituents decrease away from the axis and eventually drop below compound detection limits.

2.4 CONTAMINANTS OF CONCERN

Based on the results of the RI Report (ESE, 1988a) and the Draft Final Endangerment Assessment/Feasibility Study (EA/FS) (ESE/Harding Lawson Associates [HLA], 1989), the contaminants of concern in the Offpost OU are aldrin, benzene, DDE, chloroform, DBCP, 1,2-dichloroethane, dieldrin, arsenic, carbon tetrachloride, TCE, DIMP, DCPD, and tetrachloroethylene in alluvial ground water. The identification of these chemicals as contaminants of concern is based on their generally widespread distribution, concentration range, and general toxicity.

3.0 INTERIM RESPONSE ACTION OBJECTIVES

As part of the RMA environmental program, IRAs are being implemented to provide varying levels of site remediation prior to completing the RI/EA/FS process and in advance of issuance of the ROD for the Offpost OU. The overall objective of the IRA for the offpost study area, as specified in the Technical Program Plan (Ebasco and others, 1987) is to "...minimize the risk of future exposure from contaminated ground-water plumes north of RMA." Although available information indicates no current exposure from contaminated ground water in the offpost area, (ESE, 1988a), the mitigation of contaminant migration is included in the offpost IRA to reduce the potential for future exposure and to achieve some level of aquifer restoration prior to implementation of the final remedy. The specific response action objectives of the offpost IRA are:

- Mitigate migration of contaminants in alluvial ground water as soon as practicable.
- Treat contaminated alluvial ground water to provide a beneficial impact on ground-water quality.

The Army will also, outside the scope of this IRA, continue its current program of monitoring offpost ground-water quality and for providing an alternate drinking water supply program to eliminate potential exposure of residents to contaminated alluvial ground water.

4.0 INTERIM RESPONSE ACTION ALTERNATIVES

IRA alternatives for the proposed Ground-Water Intercept and Treatment System North of RMA were examined in the Offpost Interim Response Action Alternatives Assessment Draft Final Report, (HLA, 1988). As previously discussed, the medium of concern is contaminated alluvial ground water. Thus, IRA alternatives have been assembled to address these site conditions. The alternatives developed range from no action to a system of ground-water extraction, treatment, and recharge, as specified in the Federal Facility Agreement. Ground-water monitoring and alternative water supply options are not part of this IRA but are addressed through other ongoing programs. This IRA is directed to the remediation of RMA contaminants found in the offpost IRA area.

The following sections describe the possible components of the alternative developed for the offpost IRA. The discussions are organized into two separate sections that describe appropriate options for (1) ground-water extraction and recharge and (2) treatment. In general, the options described are conceptual, and no attempt is made to develop specific remedial alternatives in this document. Specific remedial alternatives and attendant technologies will be identified and evaluated in the IRA Implementation Document.

In addition to the actions taken within the scope of this IRA and in consultation with other organizations, the Army will continue its current program of evaluating the need to provide alternative water supplies to individuals on a case-by-case basis. This program will be affected by the guidance developed in the Final Offpost Endangerment Assessment/Feasibility Study (EA/FS) and Offpost Record of Decision scheduled for release in early 1990. The continuing program will provide alternative water supplies to residents in the offpost operable unit whose drinking water (if supplied by private wells) contains contaminants at levels above those identified as ARARs by this Decision Document or if, after consultation with the Organizations, monitoring data indicate that provision of an alternative water supply is appropriate in a particular case.

4.1 NO-ACTION ALTERNATIVE

Section IX of the Federal Facility Agreement states that the Ground-Water Intercept and Treatment System North of the RMA IRA has been determined to be both necessary and appropriate. Therefore, the no-action alternative will not be considered.

4.2 GROUND-WATER EXTRACTION, TREATMENT, AND RECHARGE ALTERNATIVE

4.2.1 Migration Control Options

4.2.1.1 Ground-Water Extraction Options

Ground water will be withdrawn from the offpost alluvium for removal of contaminants. Two types of ground-water extraction systems, dewatering wells and subsurface drains, were considered.

Dewatering Wells

Ground-water extraction within the paleochannels can be achieved with a series of wells. Ground water would be pumped from the wells to the treatment system. Well spacing, pumping rates, and aquifer characteristics determine the degree of drawdown and therefore determine the radius of influence for the wells. Extraction with wells is a proven technology that has worked well with ground-water extraction at other RMA locations.

Indications are that extraction wells should be considered as one alternative in the final design of an extraction method. Appropriate well spacings and pumping rates would be an important aspect of system design.

Subsurface Drains

Subsurface drains could effectively intercept ground water migrating along the axes of the paleochannels. Drains usually consist of a constructed permeable zone equipped with a means for lowering the water table within the zone. Typically, a trench is constructed that is filled with permeable materials and, in some cases, a buried conduit. Water draining into the trench is removed by one or more pumps. Advantages of subsurface drains include their applicability to

aquifers with a wide range of permeabilities and their high collection efficiency. A potential disadvantage can be their cost, depending on the required depth and construction difficulty.

Subsurface drains should be considered as an alternative in the final selection and design of an extraction system for the offpost alluvium. The cost of constructing a drain would depend on the design considerations as well as on the measures required to handle contaminated soils and ground water produced during construction. These factors will be an important part of the design-related evaluations of the IRA extraction system.

4.2.1.2 Ground-Water Recharge Options

Three methods of ground-water recharge were considered in the Draft Final Alternatives Assessment (HLA, 1988): recharge wells, subsurface drains, and ponds. Recharge operations could be located adjacent to the extraction operations or at a remote location. These three operations are briefly summarized below.

Recharge Wells

Wells could be used for recharging treated water back into the aquifer system. Recharging water through wells is most likely to be practical where deep permeable zones exist that cannot be feasibly recharged by other methods. When practical, other recharge methods are generally preferred over recharge wells because of the high cost, tendency for plugging, and relatively high maintenance costs of recharge wells. Particularly in the silts, clays, and fine sands, recharge wells can be expected to be difficult to keep operating efficiently. In the coarse sand zones, wells may be more suitable.

Subsurface Drains

Subsurface drains used for recharge are essentially similar to drains used for extraction discussed above, except that they are used to recharge, rather than collect, ground water. An advantage of subsurface drains is that they are suitable for creating a ground water mound that is continuous over the entire length off the drain that would help control the migration of

contaminated ground water. Another advantage of subsurface drains is that they maximize the contact area of the aquifer surface, thus maximizing the operational life and possible recharge rate. Construction costs of subsurface drains can be quite high if the depth is great, or construction is difficult. Difficulties associated with rehabilitation of drains may make them unsuitable for recharge if clogging processes can't be controlled or prevented. Because of their effectiveness, subsurface drains used for recharge would be very desirable if they are determined to be economical and significant clogging can be ruled-out.

Ponds

Recharging in shallow ponds is common, often very economical, and generally effective if geological conditions are favorable. The performance of recharge ponds is largely related to the vertical permeability of the underlying soils. Conditions favoring water infiltration (such as sandy, highly permeable soils and the absence of low-permeability layers that would impede vertical movement) increase the effectiveness and feasibility of recharge ponds. The permeabilities of the shallow alluvial materials in the offpost area are variable and not well-defined. Further characterization of alluvial materials would be necessary before the suitability of these operations could be fully evaluated.

Because the permeable portions of the aquifer offpost are often overlain by much less permeable materials, it is expected that recharging all of the aquifer flow by the use of recharge ponds may be difficult. These recharge technologies may, however, be suitable for recharging portions of the flow in some areas. Additional data and design considerations must be evaluated before such systems could be recommended.

4.3 TREATMENT OPTIONS

As stated in the IRA Alternatives Assessment (HLA, 1988), inorganic contaminants are not presently treated in the three RMA boundary ground-water intercept/treatment systems. Moreover, the need for control of inorganic compounds in ground water in the Final ROD is unknown at this time. Additionally, processes for the suite of inorganics that might require

treatment would likely also require bench-scale testing resulting in potentially significant delays in implementing the IRA. Therefore, treatment of inorganic compounds is considered impracticable within the scope of this IRA. However, inorganic contaminants can cause scaling or fouling in treatment equipment used for removal of organic contaminants. Therefore, it may become necessary to consider treatment for inorganic contaminants in order to protect organic contaminant removal equipment against fouling or scaling.

A preliminary screening of available organic contaminant treatment technologies has been performed, and only the following technologies having documented performance, applicability, and reliability are considered potentially applicable to this IRA:

1. Activated carbon adsorption
2. Air stripping
3. Biological treatment
4. Evaporation
5. Oxidation
6. Reverse osmosis
7. Ultrafiltration
8. In-situ treatment

The following discussion of each technology addresses system operation, required pretreatment, waste streams generated, reliability, design flexibility, complexity, relative cost, and advantages and disadvantages.

Activated Carbon Adsorption

Activated carbon adsorption is the most widely developed and used process for removal of organic contaminants from water and involves passing the contaminated water through a bed of activated carbon to allow the organic compounds to adsorb to the surfaces of the carbon particles. Activate carbon adsorption removes both volatile and non-volatile organic compounds from water. This process has been proven effective in removing the majority of organic contaminants

found in RMA ground water, except for certain polar compounds such as methylene chloride that do not have a great affinity for a nonpolar adsorbent such as carbon.

Activated carbon adsorption is currently used at the RMA North Boundary, Northwest Boundary, and Irondale containment/treatment systems. Operating histories at these plants indicate very high removal efficiencies for many RMA organic contaminants, including dibromochloropropane (DBCP), diisopropylmethyl phosphonate (DIMP), and dicyclopentadiene (DCPD).

Activated carbon adsorption design parameters such as adsorption isotherms and empty bed contact times have been developed through pilot testing for the majority of organic compounds encountered in offpost ground water. One pilot study in particular successfully treated ground water containing similar compounds in higher concentrations than those expected in the offpost area (Stearns-Roger Engineering Corp., 1983).

The relative advantages and disadvantages of activated carbon adsorption compared to the other treatment processes are as follows:

Advantages

- Extensive experience in utilization of process
- Ability to remove mixtures of volatile and non-volatile organic compounds
- Ease of operation
- Reliability

Disadvantages

- Possible plugging of recharge system (particularly wells) with carbon fines
- Need for carbon replacement or regeneration resulting in relatively high operating costs
- Spent carbon, if not regenerated, may require disposal as a hazardous waste

Activated carbon adsorption has been proven highly effective in the removal of most organic contaminants encountered at the RMA. As a result, it is included as one of the treatment processes for possible use in the Offpost IRA.

Air Stripping

Air stripping is an effective and proven method for removal of volatile organic compounds from water. This is accomplished through conversion of the contaminant from a liquid to a gaseous phase by contacting the liquid with air. The removal efficiencies of the compounds are proportional to their relative partial pressures. Air strippers have been used at many sites to effectively remove volatile chlorinated solvents from drinking water supplies.

A packed column type air stripper was evaluated as part of the South Plants ground-water treatment pilot plant and demonstrated removal efficiencies of 96-100 percent for many of the volatile organic compounds (Stearns-Roger Engineering Corp., 1983). As expected, the non-volatile organic compounds did not exhibit high removal efficiencies.

Off gas from an air stripper contains the organic compounds stripped from the contaminated ground water. If air emission standards would be exceeded, the exhaust air is normally either incinerated or treated with a vapor phase carbon adsorption unit to remove the contaminants.

The relative advantages and disadvantages of air stripping compared to the other treatment processes are as follows:

Advantages

- Relatively low capital and operating costs
- Ease of operation
- Reduced loading on carbon adsorption beds when used to precede carbon adsorption process

Disadvantages

- Some organic compounds are not removed
- Low removal efficiencies for non-volatile organic compounds
- Contaminated off gas may constitute waste stream requiring treatment and/or disposal

The compounds present in the offpost alluvial ground water (based on existing analytical data) that are amenable to effective removal by air stripping include chloroform, methylene

chloride, tetrachloroethylene, and trichloroethylene. As indicated previously, some compounds are not effectively removed through activated carbon adsorption. Air stripping should remain in consideration as a treatment alternative that could be used to remove many chemicals that are not effectively removed by activated carbon. The final process configuration will be determined during the design phase of the project.

Biological Treatment

Biological treatment removes organic contaminants through microbial assimilation and degradation. Aerobic processes such as activated sludge are most commonly used. The resultant waste activated liquor (excess biomass) from such processes is generally nontoxic.

An activated sludge system was tested by Shell Development Company for treating RMA ground water (Rezai, 1982). The pilot test results indicated high levels of removal of chloroform, benzene, and DBCP. Biodegradability tests using incubation, however, showed no biodegradation of aldrin, dieldrin, or endrin.

The relative advantages and disadvantages of biological treatment compared to other treatment processes are as follows:

Advantages

- Adaptability of process to a variety of contaminants
- Waste streams from system are generally nontoxic
- Relatively low capital and operating costs

Disadvantages

- Process has limited efficiency with respect to removal of certain organic compounds
- Extensive process monitoring is required
- Process is subject to upsets by compounds toxic to microorganisms
- Extensive pilot testing is required for design
- Process requires feed stream of relatively constant quantity and quality

Not all of the compounds present in the offpost ground water are readily treatable with biological systems, particularly the pesticides. While treatment of these organics may be feasible, considerable time would be spent in developing and demonstrating an effective biological treatment system. It therefore does not appear that biological treatment would be a viable alternative for the offpost groundwater and it will not further be considered.

Evaporation

Evaporation is a process by which volatile liquids such as water and certain volatile organic compounds are removed from the waste stream, leaving behind the non-volatile components. Solar evaporation ponds as well as mechanical evaporators can be used to implement this process. Dissolved solids are precipitated through evaporation and would require disposal as hazardous waste. Water lost through evaporation could be replaced in the aquifer by recharge of purchased water. Only solar evaporators were considered, because mechanical evaporators are cost-prohibitive.

The relative advantages and disadvantages of solar evaporation compared to other treatment processes are as follows:

Advantages

- Low operating cost

Disadvantages

- Release of volatiles or odors may exceed regulatory limits
- Residue concentrate/solids would require treatment and disposal as hazardous waste
- Ponds must be designed to limit access by wildlife

A solar evaporation pond to treat the waste stream would be approximately 0.75 acres in size for each gallon per minute treated (for example, an 11-acre pond would approximately handle a 15 gpm stream). A pond containing hazardous material of this size could pose a risk to wildlife and the environment in general.

Conversely, evaporation is a proven and highly effective process for waste streams containing inorganic contaminants. In the event that removal of inorganic contaminants becomes a priority, evaporation might become a treatment system of choice and should be reconsidered.

Oxidation

Oxidation involves chemical or thermal destruction of organic compounds. Thermal oxidation usually involves incineration, and chemical oxidation is accomplished using a chemical oxidizing agent such as ozone, hydrogen peroxide, or potassium permanganate. Ultraviolet (UV) radiation is often used to catalyze a chemical oxidation process in order to enhance destruction and reduce chemical and contact time requirements.

Laboratory bench-scale studies and pilot testing have indicated effective destruction of a variety of organic compounds using the UV/ozone process. Operating parameters must be carefully controlled for each target compound in order to achieve total destruction. These parameters include UV dosage, ozone dosage, pH, detention time, and use of supplemental chemical oxidants.

The relative advantages and disadvantages of oxidation compared to other treatment processes are as follows:

Advantages

- Ability to achieve virtually complete destruction of contaminants
- Produces no residual waste stream requiring further treatment

Disadvantages

- Relatively high capital and operating costs
- Possible fouling of process by inorganic elements and compounds
- Difficulty in process control
- Very poor energy efficiency because of low concentration of organics

Oxidation is a promising technology but is largely unproven for the mixture of organic compounds encountered in offpost ground water. Although effective for many organic com-

pounds, extensive pilot testing is required to demonstrate feasibility of this treatment process for a number of compounds detected in the offpost ground water. Additionally, the process requires very high capital and operating expenditures. For these reasons, this process is not anticipated to be selected as a treatment alternative; however, further evaluations of this process may be made in the future and its viability reevaluated at that time .

Reverse Osmosis

Reverse osmosis is a membrane separation process that reduces concentrations of dissolved organic and inorganic compounds. Pretreatment of reverse osmosis influent is essential to prevent fouling and plugging of the semipermeable membrane. This process is used mostly to remove inorganic dissolved solids from waste streams such as in a desalinization process. Very little literature or pilot testing data are available to predict performance of reverse osmosis in removal of organic compounds from ground water.

Waste streams up to 30 percent as large as the feed stream can be expected from the process, depending on the staging configuration of the system. These waste streams would contain higher concentrations of the organic contaminants and would require further treatment prior to disposal.

The relative advantages and disadvantages of reverse osmosis compared to other treatment processes are as follows:

Advantages

- Ability to simultaneously remove inorganic and some organic contaminants

Disadvantages

- Relatively high capital and operating costs (membranes require replacement every 2 to 3 years)
- Membrane susceptibility to fouling and plugging
- Production of reject stream requiring additional treatment such as evaporation and solids disposal, oxidation, adsorption, or air stripping

Reverse osmosis is a proven technology for removing organics with molecular weights as low as 150 to 200. The organic contaminants in the ground water include compounds with molecular weights both above and below this range (ESE/HLA, 1989). This means that unless they were adsorbed by the membrane, DCPD and DIMP and the lower molecular weight compounds would partition to the permeate, while aldrin and dieldrin would be found in the concentrate. The required removal efficiencies would consequently not be obtained by reverse osmosis for most of the compounds in ground water. In addition, extensive pretreatment would be required, pilot studies would be necessary, and capital and operating costs would be very high. Reverse osmosis is consequently eliminated from further consideration.

Ultrafiltration

Ultrafiltration is a form of filtration that is appropriate for removal of some organics. An ultrafilter is a porous membrane that is permeable to some compounds and impermeable to others. In addition to removing very small particulate matter, the process is also applicable for organic molecules generally ranging in size from 500 to 500,000 molecular weight (Weber, 1972). Removal of a substance is related to its molecular shape, size, and flexibility.

Ultrafiltration is similar to reverse osmosis except that much lower feed pressures are used, usually in the range of 5 to 100 pounds per square inch (psi). The process produces a concentrated waste stream that is usually less than 5 percent of the influent volume. As a filtration technique, ultrafiltration is relatively expensive because of its large-particulate pretreatment requirements and the costs of the membrane. However, it is a very effective process for removing many large organic molecules.

The relative advantages and disadvantages of ultrafiltration compared to other treatment processes are as follows:

Advantages

- Ability to remove large organic molecules
- Capable of operating at lower pressure than reverse osmosis

Disadvantages

- Unable to remove small organic molecules
- High capital and operating costs

Because of the relatively limited applicability of this technology to the broad range of contaminants in the offpost ground water, it is not expected to be selected for IRA design.

In-Situ Treatment

In-situ biorestoration, where applicable, is indicated as a potentially very cost-effective and environmentally acceptable remediation technology. Many contaminants in solution in ground water as well as vapors in the unsaturated zone can be completely degraded or transformed into new compounds by naturally occurring, indigenous microbial populations. In addition to the nature of the contaminant, several environmental factors are known to influence the capacity of indigenous microbial populations to degrade contaminants. These factors include dissolved oxygen, pH, temperature, oxidation-reduction potential, availability of mineral nutrients, salinity, soil moisture, the concentration of specific pollutants, and the nutritional quality of dissolved organic carbon in ground water. The limiting factor for this technology is applying the treatment process to the contaminated material. The key to successful remediation is a thorough understanding of the hydrogeologic and geochemical characteristics of the contaminated area.

It is anticipated that this treatment technology would be particularly applicable to the pesticide plumes adjacent to the northern RMA boundary. However, some of the contaminants in the IRA study area, including tetrachloroethane, may not be readily biodegradable (ESE/HLA, 1989). Because in-situ systems are generally less reliable than above-ground treatment systems, treatability studies may be necessary to design and maintain a system with an adequate level of performance.

5.0 CHRONOLOGY OF EVENTS

The significant events leading to the decision to install the ground-water intercept and treatment system described in Section 6.0 are presented below.

Date	Event
June 1987	State of Colorado, Shell Oil Company, U.S. Environmental Protection Agency, and U.S. Army agreed that 13 Interim Response Actions (including Offpost Interim Response Action Intercept and Treatment System North of RMA) would be conducted.
May 20, 1988	Draft Applicable or Relevant and Appropriate Requirements provided to EPA, the State, and Shell for comment.
June 21, 1988	Shell submits comments on draft ARARs.
June 22, 1988	EPA submits comments on draft ARARs.
July 18, 1988	State of Colorado submits comments on draft ARARs.
August 1988	Completed Offpost Remedial Investigation and Chemical-Specific Applicable or Relevant and Appropriate Requirements Draft Final Report, Version 2.1 (ESE, 1988c).
August 4, 1988	RMA Committee agrees to delay proposed Decision Document until December 27, 1988.
December 28, 1988	Completed Offpost Remedial Investigation and Chemical-Specific Applicable or Relevant and Appropriate Requirements Final Report, Version 3.1 (ESE, 1988a).
December 30, 1988	Completed Offpost Interim Response Action Alternatives Assessment Draft Final Report Version 2.3 (HLA, 1988).
	Proposed Decision Document for Offpost IRA issued for comment.

Date	Event
February 3, 1989	Comments received from EPA on Proposed Decision Document
	Comments received from Shell Oil Company on Proposed Decision Document.
	Comments received from State of Colorado on Proposed Decision Document.
March 29, 1989	Completed Offpost Endangerment Assessment/ Feasibility Study with Applicable or Relevant and Appropriate Requirements, Draft Final Report, Version 2.1 (ESE/HLA, 1989).

6.0 SUMMARY OF THE INTERIM RESPONSE ACTION PROJECT

The IRA selected for the area north of RMA consists of alluvial ground-water extraction, water treatment, and recharge. Outside the scope of this IRA, the Army will continue monitoring ground-water quality and its program to provide alternative water supplies, as necessary. The location of the system within the offpost area will be selected during final design, based on the ability of the system to meet the objectives of the IRA, cost-effectiveness, and implementability. The treatment system(s) will address migration of contaminated alluvial ground water occurring along both the First Creek and Northern Paleochannels.

The goal of early implementation tends to favor the selection of technologies/processes with demonstrated effectiveness in situations similar to those at the offpost IRA study area (i.e., similar contaminants, hydrology) and those that can be implemented without undue delay. It is expected also that certain aspects of the system design will be based on only limited data input necessary in the interest of expediting implementation. It is believed, however, that the benefit of early implementation will more than offset possible adverse effects of limited data. Typically, ground-water extraction/treatment systems consist of simple, repetitive components and are thus highly amenable to modifications/adjustments that further studies may suggest to improve system performance or to meet redefined goals.

The following sections describe the components of the selected IRA.

6.1 CONTINUED GROUND-WATER MONITORING

The existing CMP provides for semi-annual collection and analysis of ground-water samples from approximately 78 offpost alluvial and bedrock wells. Sampling of these wells and an additional number of consumptive use sources will be continued, and the total number of wells to be monitored will be modified as appropriate. For the IRA, with an expected life of at least five years, it is anticipated that wells may be added or deleted as a result of the effects of other remedial activities.

6.2 GROUND-WATER EXTRACTION AND RECHARGE OPTIONS

The final alternative selected for the IRA will incorporate ground-water extraction and recharge systems. The purpose of these systems is to remove chemicals from the ground-water system and begin to remediate the aquifer system prior to implementation of the final remedy. These systems would also utilize a treatment component as described in Section 6.4

Extraction wells and subsurface drains appear to be feasible for ground-water extraction. Wells are currently in use for ground-water extraction at all three operating boundary containment systems. However, unlike the existing containment systems (excluding the Irondale System), the migration management aspect of the offpost IRA will not include a physical barrier. Physical barriers are excluded from the IRA because they are permanent structures that will affect ground- water flow direction and velocities and could interfere with the final remedy. Although not currently in use at RMA, subsurface drains also are a viable technology for ground-water extraction.

Recharge by wells, ponds, or drains has been considered. Recharge by wells is expected to be significantly more cost-effective than recharge utilizing subsurface drains. There are several technical and operational disadvantages to using subsurface drains as recharge structures. These problems are associated with the inability to adequately rehabilitate the drain back-fill materials. As ground water is recharged, carbon fines, biological growth, or other particulate matter is introduced, causing clogging of the drain back-fill. Eventually, this results in significantly reduced recharge rates. These clogging materials generally cannot be removed and may ultimately necessitate that the drain be abandoned and replaced by other recharge facilities. Thus, for long-term technical feasibility, it appears that recharge wells are superior to the other recharge alternatives evaluated.

The conceptual design of the extraction well field consists of wells located along the axes of the offpost contaminant plumes, extending from the vicinity of the NBCS to O'Brian Canal, although many other configurations are possible. The extraction system may also consist of one or more lines of wells oriented perpendicular to the principal direction of ground-water flow.

Locating wells along the axes of the plumes would maximize the rate at which contaminants are removed from the aquifer system for a given number of wells. This would expedite the removal of chemicals along the axes of the plumes and increase the efficiency of the IRA. The final configuration of the extraction and recharge system, including the number and locations of wells or drains, will be based on additional investigations and will be presented in future design documents.

6.3 TREATMENT OPTIONS

The treatment options have been compared and evaluated on the basis of their ability to remove organic chemicals from ground water. The time required to develop and pilot test an inorganic treatment system would unnecessarily delay the implementation of this IRA and is not consistent with the interim action goal of achieving significant beneficial effects in the near term. With the exception of fluoride, inorganic species are of concern only with respect to possible scaling and fouling problems in the process equipment. For purposes of this discussion, scaling and fouling problems are assumed to be insignificant. However, final treatment system design will consider this potential difficulty.

Carbon adsorption is a proven treatment process for removal of organic compounds, and will be utilized for ground-water treatment. Activated carbon systems are not complex, are easy to operate, require no pilot studies, and could be readily implemented. Activated carbon systems currently operating at RMA show that such a system would be effective in removing the majority of contaminants detected in offpost ground water. In addition, the system will be flexible and expandable with respect to staging and pre/post-treatment requirements to maximize the potential for compatibility with the system selected for final remediation of the offpost area. If data developed later in the program indicate a need for additional treatment processes, such as air stripping or the use of activated alumina, the Army will proceed to either modify this IRA with supplemental action or pursue additional treatment through the offpost ROD, as appropriate.

6.4 HEALTH AND SAFETY PLAN

A Health and Safety Plan will be developed for the prevention of occupational injuries and illnesses during field activities at RMA. This plan will address health and safety requirements of contractors and their authorized subcontractors during construction of the IRA. Compliance with this plan will be compulsory, and the contractors will be responsible for self-enforcement and compliance with this plan. The Health and Safety Plan will be developed with consideration for known hazards as well as potential risks. Comprehensive environmental monitoring and site-specific personal protection will be combined in an effort to protect workers to the maximum extent practicable.

A site-specific Health and Safety Plan for work to be performed on the Ground-water Intercept and Treatment System North of RMA will be developed and included in the Implementation Document. This site-specific plan will contain specifics of monitoring plans, a system safety hazard analysis, worker protection, and work modifications to be conducted in the event that certain levels of contaminants are detected or, if necessary, to ensure worker health and safety.

7.0 IRA PROCESS

With respect to this IRA, the IRA process is as follows:

1. The Ground-Water Intercept and Treatment System North of RMA Draft Final IRA Alternatives Assessment Document was submitted to the Department of Interior (DOI), the State, and the other organizations for review and comment. Comments are to be submitted within 30 days after receipt of the draft assessment. After the close of the comment period and in consideration of the comments received, the Army will prepare and transmit a final assessment to the DOI, the State, and other organizations.

2. The Army afforded the DOI, the State, and the other organizations an opportunity to participate, at the RMA Committee level, in the identification and selection of ARARs pertinent to this IRA. The draft ARARs were submitted to the RMA Committee members as part of the RI Report (ESE, 1988a) and as part of the Draft Final IRA Alternatives Assessment Document (HLA, 1988).

3. The Proposed Decision Document IRA is subject to a 30-day public comment period, including a public meeting approximately two weeks into the comment period. The Proposed Decision Document is supported by an administrative record.

4. After close of the Proposed Decision Document comment period, the Army has transmitted to the DOI, the State, and other organizations this Draft Final Decision Document for the Offpost Ground-Water Intercept and Treatment System North of RMA IRA.

5. Within 20 days after issuance of the Draft Final Decision Document, an organization (including the State if it has agreed to be bound by the Dispute Resolution process, as required by the Federal Facility Agreement, or DOI under the circumstances set forth in the Federal Facility Agreement) may invoke Dispute Resolution.

6. After the close of the period for invoking Dispute Resolution (if Dispute Resolution is not invoked) or after the completion of Dispute Resolution (if invoked), the Army shall issue a final Decision Document for the Offpost Ground-Water Intercept and Treatment System North of RMA IRA with the supporting administrative record.

7. Thereafter, the Decision Document will be subject to judicial review in accordance with Sections 113 and 121 of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, 42 U.S.C. Sections 9613, 9621.

8.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

8.1 ATTAINMENT OF ARARs

The interim action process reported to the Court on June 5, 1987, in United States v. Shell Oil Co. provides that the IRAs (including the IRA for the construction of a ground-water intercept and treatment system north of RMA), shall, to the maximum extent practicable, attain ARARs. A similar provision appears in Paragraph 22.7 of the Federal Facility Agreement (effective February 17, 1989).

8.2 IDENTIFICATION AND SELECTION OF ARARs

Paragraph 22.7 of the Federal Facility Agreement provides that the Organizations, DOI, and the State shall have an opportunity to participate at the RMA Committee level in the identification and selection of ARARs that may be applicable to the IRAs. The Army is to present its proposed decision on ARARs to the other Organizations, DOI, and the State prior to or as part of the draft IRA Assessment.

In this case, the Army requested in a February 5, 1988, letter by counsel that EPA, Shell, and the State nominate by February 26, 1988, any ARARs that they believed warranted initial consideration by the Army in connection with this IRA. No responses to that letter were received.

Draft ARARs were provided to the State, EPA, and Shell for comment on May 20, 1988. Comments were received on these draft ARARs.

8.3 SELECTION OF ARARS AND DETERMINATION OF ARAR IMPACT

8.3.1 Ambient or Chemical-Specific ARARs

Ambient or chemical-specific requirements set health or risk-based concentration limits or ranges in various environmental media for specific hazardous substances, pollutants, or contaminants. Such ARARs either set protective clean-up levels for the chemicals of concern in the designated media or indicate an appropriate level of discharge.

The objectives of this IRA are stated in Section 3.0. A further significant result of this IRA is to reduce the level of contamination in the ground water and accelerate the clean-up of ground water. This IRA will be implemented prior to the final remediation to be undertaken in the context of the Offpost Operable Unit ROD. The broad range of potential ARARs previously listed in the Proposed Decision Document has been narrowed to include only those contaminants that are reasonably believed to be present in the influent for this IRA treatment system. A broader range of contaminants is addressed in the Offpost EA/FS.

Because this treatment system will not be a public water system and will not operate in navigable waters of the United States, the standards established under the Safe Drinking Water Act and the Clean Water Act for drinking water are not applicable to this IRA. These provisions are not considered applicable under the guidance contained in the Poposed NCP, 53 Fed. Reg. 51475.

The RCRA MCLs contained in 40 CFR, Section 264.94, are not considered applicable to this IRA because the constituents in the ground water are not from a regulated unit. These standards are not further considered because they are identical to those established for the same 14 compounds by NPDW regulations issued pursuant to other SDWA and contained in 40 CFR Sections 141.11-141.16, which are considered to be relevant and appropriate to apply in the context of this IRA, as discussed below.

Although the ground-water treatment system constructed pursuant to the IRA will not provide drinking water directly to 25 or more people or 15 or more service connections (making inapplicable the NPDW regulations issued pursuant to the SDWA) the MCLs established by those regulations are considered relevant and appropriate to apply to this IRA. The aquifer of concern is considered a Class II aquifer, a potential drinking-water source, and current EPA policy (OSWER Directive 9234.1-01, Section 4.2.1, August 1988, draft) is that these MCLs are relevant and appropriate to apply to ground-water remediation of such aquifer.

The Army has also determined that EPA's Tolerances for Pesticide Chemicals on or in Raw Agricultural Commodities (TPCRAC), (40 CFR, Part 180), and the Colorado Basic Standards for

Ground Water (CBSG) are not applicable, consistent with EPA guidance as contained in the Proposed NCP, 53 Fed. Reg. 51394, 51475. Also, the Food and Drug Administration's Tolerances for Pesticides in Food Administered by EPA (TPF) and the TPCRAC are not relevant and appropriate because they do not address problems that are generally pertinent to the site and are not well-suited to this particular site. These standards were developed for particular items (e.g., food and crops), which are not relevant in the context of this IRA that addresses ground-water remediation on an interim basis and are not appropriate to apply within this IRA. MCLs from the NPDW, RCRA, and CBSG that are promulgated and applied uniformly to public water systems are relevant and appropriate within the context of this IRA.

The AWQC established pursuant to the CWA are not considered applicable to the treatment system contemplated by this IRA because the system will not operate in navigable waters. Although the treated effluent is not expected to have an adverse impact on surface-water bodies located downgradient of the treatment system, this cannot be definitively determined until final design and sighting decisions have been made. If the system as finally designed and located is determined to impact surface water, AWQCs will be reviewed on a substance-by-substance basis and attained to the maximum extent practicable where they are relevant and appropriate.

For purposes of remediation of the ground water by this IRA, the Army has determined that no AWQC or Toxic Pollutant Effluent Standards (TPES) are applicable or relevant and appropriate because these standards are predicated on the consumption of both the water and aquatic organisms in the water, and aquatic organisms are not found in ground water. Moreover, the scientific basis for the AWQC as published in the Federal Register in 1980 may not be current for many compounds.

Consistent with EPA guidance, as contained in the Proposed NCP, 53 Fed. Reg. 51441, MCLGs are not considered either applicable or relevant and appropriate to apply in the context of this IRA.

Target analytes for this IRA for which promulgated standards were not found were benzothiazole, chloride, chlorobenzene p-chlorophenylmethyl sulfur compounds, copper, DBCP,

dicyclopentadiene, dieldrin, dithiane, ethylbenzene, isodrin, nitrate, sulfate, tetrachloroethylene, toluene, and xylene. Based on existing data, it is anticipated that substantial treatment of the organic compounds will occur. The necessity for treatment for inorganics (e.g., chloride and sulfate) will be assessed in the near future as ground-water remedial action objectives are developed from results of the offpost RI/FS currently being finalized. ARARs identified here will be compared with offpost remedial action objectives to ensure that clean-up objectives are consistent for the two efforts.

The Army, in conjunction with other parties, will continue its monitoring of offpost water users to determine if any individuals are exposed to drinking water containing contaminants at levels above these standards. If any such individuals are identified, they will be provided alternative drinking water under the ongoing programs outside the scope of this IRA.

The standards of 40 CFR, Part 50, were reviewed and determined to be neither applicable nor relevant and appropriate to this IRA. These standards apply to air quality control regions, which are large areas significantly dissimilar to the area that may be affected by the use of an air stripper as part of this IRA.

For this IRA, the Army will select an appropriate treatment technology for interim remediation of the ground water consistent with the IRA emphasis on speed of implementation. The Army fully anticipates that the IRA will also achieve, at the point of reinjection of the treated ground water, the following selected limitations that are relevant and appropriate under the circumstances of the potential release for the CERCLA hazardous substances, which are anticipated to be contained in the influent, specified below:

1. Arsenic

   a. CERCLA Hazardous Substance: Yes
   b. Ground-Water RI Analyte: Yes
   c. Ground-Water IRA Standard: 50 μg/l

   (Source: 40 CFR 141.11(b), NPDW - MCL)

2. Benzene

   a. CERCLA Hazardous Substance: Yes
   b. Ground-Water RI Analyte: No
   c. Ground-Water IRA Standard: 5 μg/l

   (Source: 40 CFR 141.61(a), 52 Fed. Reg. (1987) (effective January 9, 1989) (NPDW - Reg. 25716 MCL)

3. Carbon Tetrachloride

   a. CERCLA Hazardous Substance: Yes
   b. Ground-Water RI Analyte: Yes
   c. Ground-Water IRA Standard: 5 μg/l

   (Source: 40 CFR 141.52(a) Fed. Reg. 25716 (1987) (effective January 9, 1989) NPDW - MCL)

4. Chloroform

   a. CERCLA Hazardous Substance: Yes
   b. Ground-Water RI Analyte: Yes
   c. Ground-Water IRA Standard: 100 μg/l

   (Source: 40 CFR 141.12 NPDW - MCL)

   Note: This is the total combined limit for this and all other trihalomethanes.

5. 1,2-Dichloroethane

   a. CERCLA Hazardous Substance: Yes
   b. Ground-Water RI Analyte: Yes
   c. Ground-Water IRA Standard: 5 μg/l

   (Source: 40 CFR 141.61(a), NPDW - MCL)

6. Trichloroethylene (TCE)

   a. CERCLA Hazardous Substance: Yes
   b. Ground-Water RI Analyte: Yes
   c. Ground-Water IRA Standard: 5 μg/l

   (Source: 40 CFR 141.61(a), Fed. Reg. 25716 (1987) (effective January 9, 1989) NPDW - MCL)

Although not an ARAR, the "To Be Considered" (TBC) standard of 600 μg/l for DIMP (cited in the EPA's "Health Advisory for Diisopropyl Methylphosphonate") will be met, to the maximum extent practicable, for purposes of this IRA.

EPA has proposed several MCLs, 53 Fed. Reg. 31516, 54 Fed Reg. 22062, for contaminants found in drinking water. Although these Proposed MCLs have not completed public comment and review, the Army considers them TBCs in developing the design of the IRA treatment system. If new, final, MCLs, which are generally applicable to all public water systems, are promulgated by federal or state regulatory agencies prior to the completion of the final design document for this IRA, they will be considered relevant and appropriate and will be met to the maximum extent practicable.

For the contaminants of concern for which chemical-specific ARARs do not exist, the Army will utilize the Remedial Action Objectives developed in the Draft Final Offpost EA/FS[1] and the Army commits to design the treatment system to achieve at least this level for human health protection. At this time, the Army's selected protective level for dieldrin is the currently available CRL (0.06 μg/l). The Army will initiate a program to reduce the CRL for dieldrin with the goal of achieving a new, lower CRL. The progress of that effort will be reported by December 1, 1989, and if reduction of the CRL for dieldrin has been achieved by that date, the

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[1]The ground-water treatment system to be constructed pursuant to this Interim Response Action will provide significant remediation of the ground water north of the Arsenal. The specific constituents of the effluent from this system cannot be determined until after the system is operational and analyses are conducted. However, it is important to understand that the anticipated effluent will not be inconsistent with common standards used for public drinking water systems. While this effluent is not a drinking-water source, the Army believes it appropriate to apply operational goals that are similar. The Army expects the effluent from this treatment system to attain the operational goals listed below for the named constituents:

Cadmium	<0.01 mg/l
Chlordane	<0.000152 mg/l
Chromium	<0.05 mg/l
Endrin	<0.0002 mg/l
Fluoride	<4.0 mg/l
Lead	<0.05 mg/l
Mercury	<0.002 mg/l
Nitrate (as N)	<10.0 mg/l

studies for the design of the treatment system shall be modified to attain a more protective level for dieldrin at the point of reinjection of the ground water. The CRL reduction effort shall continue thereafter and the results shall be incorporated in the Final Offpost EA/FS and in any modifications made to the system constructed pursuant to this IRA.

All contaminants of concern will be further reviewed in the Final Offpost EA/FS and, if available prior to December 1, 1989, Final Remedial Action Objectives developed in the Offpost EA/FS will be incorporated into the design to the maximum extent practicable. This review will include contaminants for which remedial action objectives, including for biota are derived. In any event, the offpost ROD will reflect those revised levels to be protective of human health and the environment.

8.3.2 Location-Specific ARARs

Location-specific requirements set restrictions on activities, depending on the characteristics of the site or the immediate environment, and function like action-specific requirements. Alternative remedial actions may be restricted or precluded, depending on the location or characteristics of the site and the requirements that apply to it.

With respect to this interim action, the provisions of 40 CFR 141.5 (siting requirements for public water systems) are relevant and appropriate. The foregoing regulation does not constitute an applicable location-specific ARAR in this context. This intercept and treatment system will not constitute a public water system; therefore, the regulatory jurisdiction otherwise associated with the SDWA and the NPDW does not arise. In these circumstances, the nature of the remedial action is such that the jurisdictional prerequisites of these requirements are not met. Thus, the identified regulation is not applicable here.

Section 141.5 addresses location-specific problems or situations sufficiently similar to those encountered at the RMA CERCLA site; thus, use of this regulation is well-suited to the site, and it will be treated as relevant and appropriate. A requirement that is relevant and appropriate must be complied with to the same degree as if it were applicable. However, there is more

discretion in this determination; it is possible for only part of a requirement to be considered relevant and appropriate, with the remainder being dismissed if judged to be not relevant and appropriate in a given case.

Accordingly, this intercept and treatment system will be located to conform, to the maximum extent practicable, to the substantive siting provisions of 40 CFR 141.5 as follows:

1. The system will not be located where there is a significant risk from earthquakes, floods, fires or other disasters which could cause a breakdown of these improvements; and

2. The actions will take into account the flood plain of a 100-year flood if the actions are within the 100-year flood plain.

It should be noted that Paragraph 44.2 of the Federal Facility Agreement provides that "wildlife habitat(s) shall be preserved and managed as necessary to protect endangered species of wildlife to the extent required by the Endangered Species Act (16 U.S.C. 1531 et seq.), migratory birds to the extent required by the Migratory Bird Treaty Act (16 U.S.C. 703 et seq.), and bald eagles to the extent required by the Bald Eagle Protection Act, 16 U.S.C. 688 et seq."

While this provision is not an ARAR, it obviously must be complied with for purposes of this IRA. Based on where this intercept and treatment system will be located as well as when and where the IRA will take place, the Army believes that this IRA will have no adverse impact on any endangered species or migratory birds or on the protection of wildlife habitats. Coordination will be maintained with the U.S. Fish and Wildlife Service to ensure that no such adverse impact arises from implementation of this IRA.

The Army will comply with 40 CFR 6.302(a) and (b) concerning the location of this treatment system, avoiding the construction of this system in a manner that would have an adverse impact on wetlands or be within a flood plain.

The regulations at 40 CFR 230 were reviewed and determined not to be applicable within the context of this IRA because no discharge of dredged or fill material into waters of the United States is contemplated. Because these regulations address only the disposal of such materials into

waters of the United States, which is not contemplated, they are not considered to be relevant and appropriate to apply in the context of this IRA.

The regulations at 33 CFR 320-330 were reviewed and determined to be neither applicable nor relevant and appropriate because they address actions affecting the waters of the United States. No such actions are contemplated within the context of this IRA.

8.3.3 Action-Specific ARARs

8.3.3.1 Description

Performance, design, or other action-specific requirements set controls or restrictions on activities related to the management of hazardous substances, pollutants, or contaminants. These action-specific requirements may specify particular performance levels, actions, or technologies as well as specific levels (or a methodology for setting specific levels) for discharged or residual chemicals.

8.3.3.2 Construction of Intercept and Treatment System

Air Emissions

On the remote possibility that there may be air emissions during the course of the construction of this intercept and treatment system, the Army has reviewed all potential ambient or chemical-specific air emission requirements. As a result of this review, the Army found that there are, at present, no National or State ambient air quality standards currently applicable or relevant and appropriate to any of the volatile or semivolatile chemicals in the ground water found in the area in which construction is contemplated.

In the context of this IRA, there is only a very remote chance of any release of volatiles or semivolatiles and, even if such a release did occur, it would only be intermittent and of very brief duration (because the activity that produced the release would be stopped and modified appropriately if a significant air emission was detected by the contractor's air monitoring specialist). The Army has significant experience with the construction of extraction and reinjection wells under similar conditions and has not experienced any problems from air emissions during

construction of such facilities. The site-specific Health and Safety Plan will adequately address these concerns. This plan to be developed for use in this IRA will detail the procedures to be followed to monitor air emissions of volatiles and semivolatiles and detail operational modifications to be implemented in the event that monitoring detects specific levels of such emissions.

The National Emissions Standards for Hazardous Air Pollutants (NESHAPS) were evaluated to determine whether they were applicable or relevant and appropriate to apply in the context of this IRA. These standards were not considered applicable because they apply to stationary sources of these pollutants, not to construction activity. They were not considered relevant and appropriate because they were developed for manufacturing processes, which are significantly dissimilar to the short-term construction activity contemplated by this IRA.

The provisions of 40 CFR 50.6 will be considered relevant and appropriate. This standard is not applicable because it addresses Air Quality Control Regions, which are areas significantly larger than and different from the area of concern in this IRA. Pursuant to this regulation, there will be no particulate matter transported by air from the site that is in excess of 75 micrograms per cubic meter (annual geometric mean) and 260 micrograms per cubic meter (maximum 24-hour concentration) will not be exceeded more than once per year.

In the event that an air stripper is used in conjunction with the ground-water intercept and treatment system, the Army will treat the provisions of Colorado Air Pollution Control Regulation No. 3, Section IV (D) (3) (a), as relevant and appropriate and will use best available control technology for each regulated pollutant that potentially might be emitted in significant amounts and will re-evaluate the standards established under the Clean Air Act to determine if they may be relevant and appropriate to air stripper operations. This regulation is not applicable because the Offpost ground-water treatment system will not be a major stationary source.

The other standards at 40 CFR Part 50 were reviewed and determined to be neither applicable nor relevant and appropriate to this IRA. These standards apply to Air Quality Control Regions, which are markedly dissimilar from the area that may be affected by use of an air stripper as part of this IRA.

The standards at 40 CFR Part 61 were also reviewed and determined to be neither applicable nor relevant and appropriate to apply in the context of this IRA. The standards listed therein apply to very specific types of emissions of the subject compounds and do not include equipment sufficiently similar to an air stripper to be considered either applicable or relevant and appropriate to apply in the context of this IRA.

Worker Protection

The provisions of 29 CFR 1910.120 are applicable to workers at the site because these provisions specifically address hazardous substance response operations under CERCLA. It should be noted that these activities are presently governed by the interim rule found at 29 CFR 1910.120 but that by the time IRA activity commences at the site, the final rule found at 54 FR 9294 (March 6, 1989) will be operative. (The final rule becomes effective on March 6, 1990.)

Well Construction

The regulations at 40 CFR, Parts 144-146, concerning the Underground Injection Control Program were reviewed and determined not to be applicable to the construction of wells as part of this IRA. These regulations were developed to control the injection of material that was not already located within the immediate area, not the return of treated effluent from a ground--water treatment system. The treatment system contemplated by this IRA would temporarily redirect the flow of ground water in order to remove contamination and then return the treated ground water to the natural flow conditions. This is significantly different from the activity for which these regulations were developed, which was primarily to control the placement of hazardous waste or other specifically defined material into the ground, where it may adversely affect the aquifer. The regulations were further reviewed to determine if any provisions were relevant and appropriate to apply in the context of this IRA. None of the provisions concerning wells classified as Class I, II, III, or IV were considered relevant and appropriate to apply in the context of this IRA because they are intended to control the introduction of hazardous substances into areas where ground water could be adversely affected. Those provisions concerning Class V

injection wells were considered relevant and appropriate to apply to the construction of the reinjection wells that will be utilized by this IRA. These wells will be constructed to address the substantive concerns of 40 CFR, Sec. 144.12(c), that these wells not cause a violation of NPDW standards and not adversely affect human health. The information listed in 40 CFR, Sec. 144.26(c), will be provided after construction of this system.

8.3.3.3 General Construction Activities

The following performance, design, or other action-specific State ARARs have been preliminarily identified by the Army as relevant and appropriate to this portion of the IRA and more stringent than any applicable or relevant and appropriate Federal standard, requirement, criterion, or limitation. These standards are not applicable because they specifically do not address a remedial action or circumstance under CERCLA:

(i) Colorado Air Pollution Control Commission Regulation No. 1, 5 CCR 100-3, Part III(D)(2)(b), Construction Activities:

a. Applicability - Attainment and Nonattainment Areas

b. General Requirement

Any owner or operator engaged in clearing or leveling of land or owner or operator of land that has been cleared of greater than one (1) acre in nonattainment areas from which fugitive particulate emissions will be emitted shall be required to use all available and practical methods which are technologically feasible and economically reasonable in order to minimize such emissions, in accordance with the requirements of Section III.D. of this regulation.

c. Applicable Emission Limitation Guideline

Both the 20% opacity and the no off-property transport emission limitation guidelines shall apply to construction activities; except that with respect to sources or activities associated with construction for which there are separate requirements set forth in this regulation, the emission limitation guidelines there specified as applicable to such sources and activities shall be evaluated for compliance with the requirements of Section III.D. of this regulation. (Cross Reference: Subsections e. and f. of Section III.D.2 of this regulation).

d. Control Measures and Operating Procedures

Control measures or operational procedures to be employed may include but are not necessarily limited to planting vegetation cover, providing synthetic cover, watering, chemical stabilization, furrows, compacting, minimizing disturbed area in the winter, wind breaks, and other methods or techniques.

(ii) Colorado Ambient Air Quality Standards, 5 CCR 1001-14, Air Quality Regulation A, Diesel-Powered Vehicle Emission Standards for Visible Pollutants:

a. No person shall emit or cause to be emitted into the atmosphere from any diesel-powered vehicle any air contaminant, for a period greater than 10 consecutive seconds, which is of such a shade or density as to obscure an observer's vision to a degree in excess of 40% opacity, with the exception of Subpart B below.

b. No person shall emit or cause to be emitted into the atmosphere from any naturally aspirated diesel-powered vehicle of over 8,500 lbs gross vehicle weight rating operated above 7,000 feet (mean sea level), any air contaminant for a period greater than 10 consecutive seconds, which is of such a shade or density as to obscure an observer's vision to a degree in excess of 50% opacity.

c. Diesel-powered vehicles exceeding these requirements shall be exempt for a period of 10 minutes, if the emissions are a direct result of a cold engine start-up and provided the vehicle is in a stationary position.

d. This standard shall apply to motor vehicles intended, designed, and manufactured primarily for use in carrying passengers or cargo on roads, streets, and highways.

The following performance, design, or action-specific State ARAR is applicable to this portion of the IRA and is more stringent than any applicable or relevant and appropriate Federal standard, requirement, criterion, or limitation:

(iii) Colorado Noise Abatement Statute, C.R.S. Section 25-12-103:

a. Every activity to which this article is applicable shall be conducted in a manner so that any noise produced is not objectionable due to intermittence, beat frequency, or shrillness. Sound levels of noise radiating from a property line at a distance of twenty-five feet or more therefrom in excess of the db(A) established for the following time periods and zones shall constitute prima facie evidence that such noise is a public nuisance:

Zone	7:00 a.m. to next 7:00 p.m.	7:00 p.m. to next 7:00 a.m.
Residential	55 db(A)	50 db(A)
Commercial	60 db(A)	55 db(A)
Light Industrial	70 db(A)	65 db(A)
Industrial	80 db(A)	75 db(A)

b. In the hours between 7:00 a.m. and the next 7:00 p.m., the noise levels permitted in subsection (1) of this section may be increased by ten db(A) for a period of not to exceed fifteen minutes in any one-hour period.

c. Periodic, impulsive, or shrill noises shall be considered a public nuisance when such noises are at a sound level of five db(A) less than those listed in Subpart (a) of this section.

d. Construction projects shall be subject to the maximum permissible noise levels specified for industrial zones for the period within which construction is to be completed pursuant to any applicable construction permit issued by proper authority or, if no time limitation is imposed, for a reasonable period of time for completion of the project.

e. For the purpose of this article, measurements with sound level meters shall be made when the wind velocity at the time and place of such measurement is not more than five miles per hour.

f. In all sound level measurements, consideration shall be given to the effect of the ambient noise level created by the encompassing noise of the environment from all sources at the time and place of such sound level measurements.

In substantive fulfillment of Colorado Air Pollution Control Commission Regulation No. 1, this IRA will employ the specified methods for minimizing emissions from fuel burning equipment and construction activities. In substantive fulfillment of Colorado's Diesel-Powered Vehicle Emission Standards, no diesel motor vehicles associated with the construction shall be operated in a manner that will produce emissions in excess of those specified in these standards.

The noise levels pertinent for construction activity provided in C.R.S. Section 25-12-103 will be attained in accordance with this applicable Colorado statute.

8.3.3.4 Wetlands Implications

Through examination of the general area where a system would be located, the Army does not believe that any wetlands could be adversely affected. However, until a final design is selected and a final siting decision made, it cannot be definitively determined that no impact on wetlands will occur. If the final site selection and/or design results in an impact on wetlands, the Army will review the regulatory provisions concerning wetlands impact and other appropriate guidance, and will proceed in a manner consistent with those provisions. Coordination will be maintained with the U.S. Fish and Wildlife Service concerning any potential impacts on wetlands.

8.3.3.5 Land Disposal Restrictions and Removal of Soil

There are no action-specific ARARs that pertain to the drilling or excavation of soil during the construction of this intercept and treatment system IRA.

EPA is currently developing guidance concerning the Land Disposal Restrictions (LDR). While guidance is limited, the Army has no reason to believe that any listed waste subject to LDR will be present in the influent treated by this IRA. More listings are scheduled to be completed prior to the implementation of this IRA and the Army will review these as they are released. If it is determined that a listed waste is present, the Army will act in a manner consistent with EPA guidance for the management of such wastes in the context of CERCLA cleanup actions.

Although removal of soil from the areas where the intercept and treatment system will be located is a TBC, not an ARAR, it will be performed in accordance with the procedures set forth in the Task No. 32 Technical Plan, Sampling Waste Handling (November 1987), and EPA's July 12, 1985, memorandum regarding "EPA Region VIII Procedure for Handling of Materials from Drilling, Trench Excavation and Decontamination during CERCLA RI/FS Operations at the Rocky Mountain Arsenal." In general, any soils generated by drilling or excavation during the course of this IRA, either at surface or subsurface, will be returned to the location from which they originated (i.e., last out, first in). Any materials remaining after completion of backfilling that are suspected of being contaminated (based on field screening techniques[2]) will be properly stored, sampled, analyzed, and ultimately disposed as CERCLA hazardous wastes, as appropriate.

For materials determined to be hazardous waste, substantive RCRA provisions are applicable to their management. These substantive provisions include but are not limited to: 40 CFR Part 262 (Subpart C, Pre-Transport Requirements), 40 CFR Part 263 (Transporter Standards), and 40 CFR Part 264 (Subpart I, Container Storage and Subpart L, Waste Piles). The specific substantive standards applied will be determined by the factual circumstances of the accumulation, storage, or disposal techniques actually applied to any such material.

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[2]The field screening techniques to be used to determine contamination are HNU, OVA, discoloration (visual) and odor. Readings or visual and odor inspection will be taken at least every five feet.

8.3.4 Compliance with the Other Environmental Laws

As is evident from the various portions of this document, this IRA was prepared in substantive compliance with CFR 1502.16 (the regulations implementing the National Environmental Policy Act of 1969).

9.0 SCHEDULE

The Draft Implementation Document will be completed in June 1990. This milestone has been developed on the basis of the Final Assessment Document and the assumption that no dispute resolution will occur. The Draft Implementation Document will contain a schedule of milestones for construction of the proposed system. If events occur that necessitate a schedule change or extension, the change will be incorporated in accordance with the discussion in Section XXII of the Federal Facility Agreement.

10.0 CONSISTENCY WITH THE FINAL REMEDY

The purpose of this IRA is to mitigate the migration of contaminated ground water through the offpost alluvial aquifer pending implementation of the final remedy. The IRA is interrelated with the Offpost and Onpost RODs to address the broad range of concerns involving contamination in the area of the Arsenal. Although the final remedy has not been selected at this time, this IRA will be consistent with and contribute to the efficient performance of the final remedy through the reduction of contaminant migration and the remedial effects on offpost ground water. The implementation of the ground-water remediation through this IRA, in conjunction with the implementation of the Offpost ROD, will be protective of human health and the environment by addressing potential exposure to contamination in the offpost area.

11.0 REFERENCES

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Appendix A

COMMENTS AND RESPONSES

STATE OF COLORADO

COLORADO DEPARTMENT OF HEALTH
4210 East 11th Avenue
Denver, Colorado 80220
Phone (303) 320-8333

Roy Romer
Governor

Thomas M. Vernon, M.D.
Executive Director

February 3, 1989

Mr. Donald Campbell DC
Office of the Program Manager for
Rocky Mountain Arsenal
Attn: AMXRM-PM, Building 111
Commerce City, CO 80022-2180

Re: State Comments on Proposed Decision for the Groundwater Intercept and Treatment System North of Rocky Mountain Arsenal, December, 1988

Dear Mr. Campbell:

Enclosed are the State's comments on the Proposed Decision Document for the Groundwater Intercept and Treatment System North of Rocky Mountain Arsenal, dated December, 1988. If you have any questions on the attached comments, please contact Mr. Jeff Edson with this division.

Sincerely,

David C. Shelton, Director
Hazardous Materials and
Waste Management Division

DCS/rw

enclosure

pc: Michael R. Hope
David L. Anderson
Chris Hahn
Edward J. McGrath
Connally Mears
Mike Gaydosh
Lt. Col. Scott Isaacson
Tony Truschel

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STATE COMMENTS ON PROPOSED DECISION DOCUMENT FOR THE GROUNDWATER INTERCEPT AND TREATMENT SYSTEM NORTH OF ROCKY MOUNTAIN ARSENAL, DECEMBER, 1988

1. Pg. 1, Section 1. The introduction to the Decision Document states that "this IRA project consists of the design and construction of an alluvial groundwater intercept and treatment system north of RMA. Pursuant to Col. Quintrell's August 31, 1988 letter to Mr. David Shelton, the Army has committed to construct one or more pump and treat systems off-post as part of this interim action. Two plumes of groundwater contamination are known to be migrating off-post and have been clearly defined -- the First Creek plume and the Northern Paleochannel plume. The Northern Paleochannel plume contributes a significant amount of contamination to the groundwater off-post in addition to the contaminant contribution from the First Creek plume. The existence of these two plumes indicate that there is a need to install and operate two separate groundwater intercept and treatment systems as part of this interim action.

Furthermore, at the January 17, 1989 public meeting regarding this interim action, the Army committed to remediate both contamination plumes; to conduct long-term off-post monitoring of domestic water wells and groundwater monitoring wells; and to immediately provide alternate drinking water supplies to residents exposed to RMA contaminants. Therefore, the Decision Document should be modified to

reflect that at least two pump and treat systems will be needed to treat the contaminated groundwater north of the Arsenal. Additionally, the systems should be designed and located to intercept the contamination which will continue to circumvent the North Boundary Containment System even after the improvements to that system are installed.

2. Pp. 2-3 and Figure 1-2. The study area is too restrictive to meet all of the objectives of this interim action. The State concurs that the groundwater intercept and treatment systems should be sited within the bounds of the proposed study area. However, RMA contaminants are known to exist in the groundwater as far north as the South Platte River. Therefore, the study area must be expanded to include all off-post areas which may require alternate water supplies and/or monitoring.

3. Figure 2-3. Figure 2-3 is misleading to the reader because it contains only a select number of RMA contaminants and because the lateral extent of contamination is not accurately represented. Chloride, chlorobenzene, chloroform, DIMP, fluoride, and sulfate contamination is known to extend beyond the plumes depicted in this figure. This figure must be revised to contain all known RMA contaminants and to show the full extent of lateral contamination in the alluvial aquifer.

4. Pg. 11, Sections 2.2-2.4. It is inappropriate for the Army to assume that the only "contaminants of concern" are those select contaminants listed in Section 2.4. All contaminants identified in Section 2.3 and in the Off-Post Operable Unit Final Report which have migrated off-post are of concern and must be remediated to attain a level or standard of control which at least attains Maximum Contaminant Level Goals established under the Safe Drinking Water Act and water criteria established under Section 304 or 305 of the Clean Water Act" (Section 121(d) of the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA") as amended) unless the U.S. EPA determines that compliance with MCLGs is technically impracticable from an engineering perspective. CERCLA, Section 121(d)(4)(c). If MCLGs cannot be attained due to technical impracticability, Maximum Contaminant Levels ("MCLs") must be attained.

5. Pg. 12, Section 3.0. The text states that there is "no current exposure from contaminated groundwater in the off-post area." Presumably, this statement means that there is no exposure pathway to residents living in the off-post study area. This statement is inaccurate. A number of residents in the off-post area use contaminated well water for domestic purposes, including cooking, washing, and bathing. Therefore, the inaccurate statement regarding exposure from

contaminated groundwater should be corrected or deleted from the text.

The text refers to an ESE document dated 1987. The references contained in Section 11.0 do not include this document. The specific title of the document referred to should be included in the text of the references.

6. Pg. 12, Section 3.0. The first objective of this interim action is to "continue current programs for off-post ground-water monitoring and for providing an alternate drinking water supply program to eliminate exposure of residents to contaminated alluvial ground water." As noted above, there are residents in the off-post area who use contaminated groundwater for domestic purposes. Nonetheless, the State is not aware that the Army is supplying or has supplied an alternate drinking water supply to anyone. Therefore, the Army's current program for supplying alternate drinking water supplies is ineffective and must be revised. The Army should supply bottled water or new permanent water supplies to all exposed residents whenever RMA contaminants are detected in domestic wells above naturally occurring background concentrations.

7. Pp. 27-28, Section 6.1. The text indicates that continued groundwater monitoring will be performed under the Com-

prehensive Monitoring Program (CMP). The Draft Final Technical Plan for the CMP does not include any provisions for monitoring domestic wells. Therefore, the Decision Document must be modified to include a list of wells to be monitored under this interim action (both monitoring and domestic wells),the frequency at which these wells will be monitored, and the list of parameters to be analyzed. The text should also explain the criteria to be used for selecting domestic wells to be monitored.

8. Pg. 28, Section 6.2. The text indicates that the preferred option for providing an alternate water supply to potentially exposed populations in the off-post area will be selected on a case-by-case basis at a future date. In the interest of protecting public health, this decision must not be postponed. The Army should immediately supply bottled water to all exposed residents. The purpose of a decision document is to select a preferred alternative. The Army should select one or a combination of the five options contained in this section.

9. Pp. 33-34, Section 8.0 and Appendix A. The text indicates that comments were received on the Army's proposed draft ARARs. The Army has consistently ignored all promulgated chemical-specific ARARs identified by the State. This practice is inconsistent with U.S. EPA actions at Colorado

CERCLA sites and is not consistent with Section 121(d) of CERCLA. To the extent the State promulgated standards are more stringent than the federal standards, the State standards must be met. Attachment I contains State identified chemical-specific standards (ARARs).

10. Pg. 34, Section 8.3. The text states "if there is no established MCL, the Army will consider the TPES to be the ARAR. TPES should be defined somewhere is the text. Furthermore, while the text indicates that the TPES will be used as the ARAR in the absence of an MCL, no TPES number appears anywhere in the ARAR section. Therefore, it is unclear why this reference is used. See comment number 4 above as to the appropriate standard which must be attained through treatment of the groundwater.

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ATTACHMENT 1

STATE IDENTIFICATION OF ADDITIONAL CHEMICAL-SPECIFIC ARARS FOR OFFPOST OPERABLE UNIT AT RMA

REFERENCE

(1) Colorado Basic Standards for Ground Water, 5 CCR 1002-8, Section 3.11.0 - 3.11.9 (in particular Tables 1, 2, and 3).

(2) Colorado Basic Standards and Methodologies, 5 CCR 1002-8, Section 3.1.0 - 3.1.20 (in particular Section 3.1.11).

(3) Federal Safe Drinking Water Act (in particular Maximum Contaminant Level Goals - MCLGs).

(4) Federal Safe Drinking Water Act (in particular Maximum Contaminant Levels - MCLs).

(5) Federal Clean Water Act (in particular Water Quality Criteria for Protection of Human Health).

Chemical	Abbreviation	Water Quality Standard (Reference) all values in ug/l		
Aldrin	ALDRN	0(2)	0.000074(5)	
Arsenic	AS	50(1)	50(4)	
Benzene	C6H6		0(3)	5(4)
Carbon tetrachloride	CCL4		0(3)	5(4)
Chloride	CL	250,000(1)		
Chlorobenzene	CLC6H5	0(2)		
Chloroform	CHCL3	.19(5)		
Chlorophenylmethyl sulfide	CPMS	0(2)		
Chlorophenylmethyl sulfone	CPMSO2	0(2)		
Chlorophenylmethyl sulfoxide	CPMSO	0(2)		
Chromium	CR	50(1)	1.2(3)*	50(4)
Copper	CU	200(1)	1300(3)*	
Dibromochloropropane	DBCP	0(2)	0(3)	
Dichlorobenzenes	CL2BZ		75(3)	75(4)
Dichlorodiphenylethane	PPDDE	0(2)		
Dichlorodiphenyl trichloroethane	PPDDT	0(2)		
1,1-Dichloroethane	11DCLE	0(2)		
1,2-Dichloroethane	12DCLE		0(3)	5(4)
1,2-Dichloroethylene	12DCE	0(2)		
2,4-Dichlorophenoxyacetic acid	24D		7(3)	100(4)
Dicyclopentadiene	DCPD	0(2)		
Dieldrin	DLDRN	0(2)	0.000071(5)	
Diisopropylmethyl phosphonate	DIMP	0(2)		

Chemical	Abbreviation	Water Quality Standard (Reference) all values in ug/l		
Dimethylmethylphosphate	DMMP	0(2)		
Dithiane	DITH	0(2)		
Endrin	ENDRN	0.2(1)	0.2(4)	
Ethylbenzene	ETC6H5	0(2)	680(3)*	
Fluoride	F	4000(1)	4000(4)	
Iron	FE	300(1)		
Isodrin	ISODR	0(2)		
Lead	PB	50(1)	20(3)*	50(4)
Mercury	HG	2(1)	2(4)	
Methylene chloride	CH2CL2	0(2)		
Nitrite	NIT	1000(1)		
Nitrate		10,000(1)	10,000(4)	
Oxathiane	OXAT	0(2)		
pH	PH	6.5 - 8.5(1)		
Sulfate	SO4	250,000(1)		
Tetrachloroethylene	TCLEE	0(2)	0(3)*	
Toluene	MEC6H5	0(2)	2000(3)*	
Trichloroethylene	TRCLE		0(3)	5(4)
All Unknowns	UNK---	0(2)		
All Other Organic Compounds		0(2)		
Xylenes	XYLEN	0(2)		
Zinc	ZN	500(1)		

*Proposed Maximum Contaminant Level Goals

STATE COMMENTS ON PROPOSED DECISION DOCUMENT FOR THE GROUNDWATER INTERCEPT AND TREATMENT SYSTEM NORTH OF ROCKY MOUNTAIN ARSENAL
DECEMBER 1988

COMMENTS: Pg. 1, Section 1. The introduction to the Decision Document states that "this IRA project consists of the design and construction of an alluvial groundwater intercept and treatment system north of RMA. Pursuant to Col. Quintrell's August 31, 1988 letter to Mr. David Shelton, the Army has committed to construct one or more pump and treat systems off-post as part of this interim action. Two plumes of groundwater contamination are known to be migrating off-post and have been clearly defined -- the First Creek plume and the Northern Paleochannel plume. The Northern Paleochannel plume contributes a significant amount of contamination to the groundwater off-post in addition to the contaminant contribution from the First Creek plume. The existence of these two plumes indicate that there is a need to install and operate two separate groundwater intercept and treatment systems as part of this interim action.

Furthermore, at the January 17, 1989 public meeting regarding this interim action, the Army committed to remediate both contamination plumes; to conduct long-term off-post monitoring of domestic water wells and groundwater monitoring wells; and to immediately provide alternate drinking water supplies to residents exposed to RMA contaminants. Therefore, the Decision Document should be modified to reflect that at least two pump and treat systems will be needed to treat the contaminated groundwater north of the Arsenal. Additionally, the systems should be designed and located to intercept the contamination which will continue to circumvent the North Boundary Containment System even after the improvements to that system are installed.

RESPONSE:

As stated on pages 2 (end of second paragraph) and 27 (first paragraph): "this IRA will address the migration of contaminated alluvial ground water occurring along the First Creek and Northern Paleochannels." The need to provide interim remediation of these areas does not necessarily require that two systems be installed. Based on the final system design, although more than one intercept/recharge system may be needed, a single treatment system may be sufficient to provide interim remediation of the contaminated ground water flowing along the First Creek and Northern Paleochannels.

The document also indicates in Section 6.0 that "The IRA selected for the area north of RMA consists of continued ground-water monitoring, provision of an alternate water supply, as necessary, and alluvial ground-water extraction, water treatment, and recharge."

It is not clear what the State is referring to in the last sentence of this comment. Additional information is required on where the State feels contamination "will continue to circumvent the North Boundary System", before the Army can respond to this comment. No revision to the document is necessary in response to this comment.

COMMENT: Pp. 2-3 and Figure 1-2. The study area is too restrictive to meet all of the objectives of this interim action. The State concurs that the groundwater intercept and treatment systems should be sited within the bounds of the proposed study area. However, RMA contaminants are known to exist in the ground water as far north as the South Platte River. Therefore, the study area must be expanded to include all off-post areas which may require alternate water supplies and/or monitoring.

RESPONSE:

The study area shown defines the area within which the ground-water intercept and recharge system will likely be located. The need for alternative water supplies over a broader area is being reviewed in the Offpost EA/FS. The document has been revised to indicate the current alternative water supply program, outside the scope of this IRA, will be continued and an alternative water supply will be provided immediately if a well is found to contain RMA-derived contaminants above established health criteria.

COMMENT: Figure 2-3. Figure 2-3 is misleading to the reader because it contains only a select number of RMA contaminants and because the lateral extent of contamination is not accurately represented. Chloride, chlorobenzene, chloroform, DIMP, fluoride, and sulfate contamination is known to extend beyond the plumes depicted in this figure. This figure must be revised to contain all known RMA contaminants and to show the full extent of lateral contamination in the alluvial aquifer.

RESPONSE:

Figure 2-3 shows the distribution of contamination within the IRA study area and the area immediately upgradient. The figure is not intended to show the extent of contam-

ination for the entire Offpost Operable Unit. No revision to the document is necessary in response to this comment.

COMMENT: Pg. 11, Sections 2.2-2.4. It is inappropriate for the Army to assume that the only "contaminants of concern" are those select contaminants listed in Section 2.4. All contaminants identified in Section 2.3 and in the Off-Post Operable Unit Final Report which have migrated off-post are of concern and must be remediated to attain a level or standard of control which at least attains Maximum Contaminant Level Goals established under the Safe Drinking Water Act and water criteria established under Section 304 and 305 of the Clean Water Act" (Section 121(d) of the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA") as amended) unless the U.S. EPA determines that compliance with MCLGs is technically impracticable from an engineering perspective. CERCLA, Section 121(d) (4) (c). If MCLGs cannot be attained due to technical impracticability, Maximum Contaminant Levels ("MCLs") must be attained.

RESPONSE:

For purposes of this IRA, contaminants of concern are those which are expected to be contained in any influent to a groundwater treatment system. The State fails to distinguish between a final response action and an interim response action in its discussion of MCLGs. The Army is aware of no guidance published by EPA which indicates MCLGs should be considered as ARAR's for interim response actions. The State's position asserted in the comments is inconsistent with EPA's guidance concerning remedial actions.

COMMENT: Pg. 12, Section 3.0. The text states that there is "no current exposure from contaminated groundwater in the off-post area." Presumably, this statement means that there is no exposure pathway to residents living in the off-post study area. This statement is inaccurate. A number of residents in the off-post area use contaminated well water for domestic purposes, including cooking, washing, and bathing. Therefore, the inaccurate statement regarding exposure from contaminated groundwater should be corrected or deleted from the text.

The text refers to an ESE document dated 1987. The references contained in Section 11.0 do not include this document. The specific title of the document referred to should be included in the text of the references.

RESPONSE:

The text states "...available information indicates no current exposure from contaminated ground water in the offpost area..." The Army believes this statement to be correct and is unaware of any resident in the offpost area who may be consuming ground water with concentrations of RMA-derived chemicals exceeding health standards. Shell, in cooperation with the Army, is supplying bottled water to one family because concentrations in water from that domestic well are suspected of exceeding health standards. Exposure pathways other than consumption are not considered part of this IRA, but are being addressed in the EA/FS. The reference list has been revised in response to this comment.

COMMENT:

Pg. 12, Section 3.0. The first objective of this interim action is to "continue current programs for off-post ground-water monitoring and for providing an alternate drinking water supply program to eliminate exposure of residents to contaminated alluvial ground water." As noted above, there are residents in the off-post area who use contaminated groundwater for domestic purposes. Nonetheless, the State is not aware that the Army is supplying or has supplied an alternate drinking water supply to anyone. Therefore, the Army's current program for supplying alternate drinking water supplies is ineffective and must be revised. The Army should supply bottled water or new permanent water supplies to all exposed residents whenever RMA contaminants are detected in domestic wells above naturally occurring background concentrations.

RESPONSE:

Shell is currently supplying an alternative water source in one specific case. The Army and EPA have worked with the South Adams County Water and Sanitation District to construct a water supply system to replace certain water. The comment's recommendation that alternative water supplies be supplied to anyone whose domestic water supply contains contamination above "naturally occurring background concentrations" is inconsistent with the approach taken by any public agency. The Army does not believe

that the Colorado Department of Health recommends to public water suppliers and municipalities in Colorado that alternative water supplies be provided to every resident whose water supplies include manmade (i.e. unnatural) compounds.

COMMENT: Pg. 27-28, Section 6.1. The text indicates that continued groundwater monitoring will be performed under the Comprehensive Monitoring Program (CMP). The Draft Final Technical Plan for the CMP does not include any provisions for monitoring domestic wells. Therefore, the Decision Document must be modified to include a list of wells to be monitored under this interim action (both monitoring and domestic wells), the frequency at which these wells will be monitored, and the list of parameters to be analyzed. The text should also explain the criteria to be used for selecting domestic wells to be monitored.

RESPONSE:

Routine monitoring of private wells within the IRA Study Area will eventually be incorporated into the Comprehensive Monitoring Program (CMP). When this takes place, the Technical Plan for the CMP will be revised, as appropriate. Plans for monitoring domestic wells will also be presented in the Implementation Document for this IRA. The Army, with the assistance of Tri-County Health Department, is currently identifying wells within the IRA Study Area that will require routine monitoring. Once they are identified, it is expected that these wells will be monitored on an annual basis for the same analytes listed in the Offpost RI Report.

COMMENT: Pg. 28, Section 6.2. The text indicates that the preferred option for providing an alternate water supply to potentially exposed populations in the off-post area will be selected on a case-by-case basis at a future date. In the interest of protecting public health, this decision must not be postponed. The Army should immediately supply bottled water to all exposed residents. The purpose of a decision document is to select a preferred alternative. The Army should select one or a combination of the five options contained in this section.

RESPONSE:

The Army will continue its current program outside the scope of this IRA to immediately provide bottled water to any resident whose domestic water well contains RMA-derived contaminants in the ground water at concentrations exceeding drinking water health standards. Following this immediate step, the Army will evaluate, on a case-by-case basis, the appropriate long-term alternate water supply. The document has been revised to reflect this approach to supplying an alternate source of drinking water. The off-post EA/FS will address this concern in a more comprehensive manner.

COMMENT: Pp. 33-34, Section 8.0 and Appendix A. The text indicates that comments were received on the Army's proposed draft ARARs. The Army has consistently ignored all promulgated chemical-specific ARARs identified by the State. This practice is inconsistent with U.S. EPA actions at Colorado CERCLA sites and is not consistent with Section 121(d) of CERCLA. To the extent the State promulgated standards are more stringent than the federal standards, the State standards must be met. Attachment I contains State identified chemical-specific standards (ARARs).

RESPONSE:

This section was substantially revised in response to the comments received. Appendix A has been deleted. State standards have been considered in this revised section.

COMMENT: Pg. 34, Section 8.3. The text states "if there is not established MCL, the Army will consider the TPES to be the ARAR. TPES should be defined somewhere in the text. Furthermore, while the text indicates that the TPES will be used as the ARAR in the absence of an MCL, no TPES number appears anywhere in the ARAR section. Therefore, it is unclear why this reference is used. See comment number 4 above as to the appropriate standard which must be attained through treatment of the groundwater.

RESPONSE:

This section has been substantially revised in response to the comments received.

Shell Oil Company

c/o Holme Roberts & Owen
Suite 4100
1700 Lincoln
Denver. CO 80203

February 2, 1989

Office of the Program Manager
for Rocky Mountain Arsenal
ATTN: AMXRM-PM: Mr. Donald Campbell
Rocky Mountain Arsenal, Building 111
Commerce city, Colorado 80022-2180

Dear Mr. Campbell:

Enclosed is Shell Oil Company's comments on the Offpost Interim Response Action Alternatives Assessment Draft Final Report and the Proposed Decision Document for the Groundwater Intercept and Treatment System North of Rocky Mountain Arsenal. As indicated in our comments, we are concerned that the limited amount of data is insufficient to define containment plumes. ARAR comments will be addressed in a separate letter.

Sincerely,

Chris K. Hahn
Manager, Denver Site Project

CKH:dmc
Enclosure

cc: (w/enclosure)
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SHELL OIL COMPANY COMMENTS
ON THE
OFFPOST INTERIM RESPONSE ACTION
ALTERNATIVES ASSESSMENT
DRAFT FINAL REPORT

1. Page 2, second full paragraph (also page 5, second paragraph; and Fig. 1-3

   For this IRA, the Decision Document was issued with, not following, the Alternatives Assessment. It should be noted in this report that all parties agreed that the Alternatives Assessment could be issued for comment at the same time as the Decision Document.

2. Page 4, first bullet

   The Northern Paleochannel only exists offpost; it is not a primary pathway for migration across the RMA boundary.

3. Figure 2-2

   The primary groundwater flow path towards the North Boundary Containment System does not go through Section 23 as implied by the location of the arrow on the Figure. A much larger groundwater flow migrates towards the boundary system through Section 24, near First Creek.

4. Figure 2-3

   This map shows large areas covered with groundwater contamination where data are not available to support the supposition. This map

is consequently misleading. Presenting the maps included in the RI showing the contaminants of interest would be much more informative. For example, examining these RI maps shows that only a few of the contaminants identified on Figure 2-3 have been identified in the so-called First Creek plume, and even these contaminants have been found in only a few, widely scattered wells. Hence, indication of contaminant plumes is inappropriate based on this very limited data.

5. Page 12, last sentence of first full paragraph

Shell is not aware of any areas in which First Creek receives flow from Denver Formation groundwater, as stated, except indirectly by way of the alluvial aquifer.

6. Page 12, last paragraph

It would be appropriate to explain where First Creek flows go when they exceed the capacity of the O'Brian Canal.

7. Page 14, Section 2.3

A list of chemicals detected within the study area is provided, but the basis of this listing is not discussed. It is suspected that, in some cases, questionable or "suspect" analytical data was used to prepare this listing.

8. Page 15, first paragraph, last sentence

Shell questions if sufficient data points are available to define the leading edge of the Northern Paleochannel plume, especially downgradient of the O'Brian Canal.

9. Page 17, first paragraph

There is no reference in Section 7 for "Ebasco and others, 1987".

10. Page 21, second full paragraph

It is true that clogging is a potential problem associated with recharging water into drains. The magnitude of this problem is not yet known. It is already known that clogging is a serious problem associated with recharging water into wells in the nearby North Boundary Containment System.

11. Page 21, last paragraph

Just because recharging in the North Bog has created some high water table problems is not sufficient reason to assume that similar problems would exist within the entire Offpost Operable Unit. The site-specific hydrogeologic conditions and proposed operations must be evaluated before such problems could be determined. Recharge ponds work very successfully in many cases in other areas.

12. Page 32, Section 6.1.2

Combinations of the various alternatives may be the most cost-effective way of supplying alternative water sources. For example, some homes may be most economically connected to an existing municipal water supply, while others may be more economically served with installation of a deep well.

13. Page 33, Section 6.1.3

This section seems to imply that an extraction system will be constructed along both the Northern and the First Creek plumes. Implementation of any extraction system along the First Creek plume should be done only after a more thorough and meaningful assessment of the need for the system. This assessment should include an evaluation of the distribution of the contaminants of concern in the First Creek area.

14. Page 34, second paragraph, last sentence

Why are wells "technically superior" to subsurface drains?

15. Page 35, Section 6.1.3.2 (also Table 6-3)

The conclusion that recharge wells are more cost-effective than subsurface recharge drains is based on assumptions of the number of wells and the length of trench required to handle the estimated flow of 300 gpm. The conclusion is no better than the assumptions, which appear to have no substantial bases.

Clogging may be a problem with subsurface drains. However, it is a demonstrated significant problem in wells at the North Boundary Containment System. The high costs of regular maintenance that may be required with recharge wells could potentially be more of a problem than possible periodic replacement of surface drains. Whether or not trenches or wells are most appropriate depends on the site specific conditions and requirements.

16. Page 37, second paragraph

Same as Comment #12.

17. Page 37, second paragraph

Same as Comment #15.

SHELL OIL COMPANY COMMENTS
ON THE
PROPOSED DECISION DOCUMENT FOR THE
GROUNDWATER INTERCEPT AND TREATMENT SYSTEM
NORTH OF ROCKY MOUNTAIN ARSENAL

1. Page 1, first paragraph

   The introduction should note that the Army committed to a groundwater intercept and treatment system in a letter to the Colorado Department of Health dated August, 1988.

2. Page 1, second paragraph

   According to Section 6.0, this IRA also includes a groundwater monitorng program and an alternative water supply program.

3. Page 3, number 1

   The First Creek and Northern Paleochannels are the primary pathways for offpost migration north of the RMA boundary, not across the boundary.

4. Page 3, number 2

   Although this statement is correct, it should be also noted that most of the contaminants of concern have not even been detected downgradient of the O'Brian Canal.

5. Figure 2-2

The primary groundwater flow path towards the North Boundary Containmment System does not go through Section 23 as implied by the location of the arrow on the figure. A much larger groundwater flow migrates towards the boundary system through Section 24, near First Creek.

6. Figure 2-3

This map shows large areas covered with groundwater contamination where data are not available to support the supposition. This map is consequently misleading. Presenting the maps included in the RI showing the contaminants of concern would be much more informative. For example, examining these RI maps shows that only a few of the contaminants identified on Figure 2-3 have been identified in the so-called First Creek plume, and even these contaminants have been found in only a few, widely scattered wells. Hence, indication of contaminant plumes is inappropriate based on the very limited data.

7. Page 8, first line

Shell is not aware of any areas in which First Creek receives flow from Denver Formation groundwater, as stated, except indirectly by way of the alluvial aquifer.

8. Page 8, first full paragraph

It would be appropriate to explain where First Creek flows go when they exceed the capacity of the O'Brian Canal.

9. Page 9, Section 2.2, line 6

The First Creek plume reaches the O'Brian Canal in central Section 14.

10. Page 9, Section 2.3

A list of chemicals detected within the study area is provided, but the basis of this listing is not discussed. It is suspected that, in some cases, questionable or "suspect" analytical data was used to prepare this listing.

11. Page 13, first paragraph (and Section 4.1)

The proposed Consent Decree states that a groundwater intercept and treatment system north of the RMA should be assessed, but does not state that it must be implemented. Shell recognizes that the proposed Federal Facility Agreement would require the implementation of this system.

12. Page 14, last two sentences of first partial paragraph

Several factors, such as volatility, concentration, and rate of uptake of the contaminant, would have to be considered before a decision is made that bathing is a potential route of exposure. This issue should be discussed in a meeting of the parties before any decision is made.

13. Page 14, first partial paragraph

Combinations of the various alternatives may be the most cost-effective way of supplying alternative water sources. For example, some homes may be most economically connected to an existing municipal water supply, while others may be more economically served with installation of a deep well.

14. Page 16, last paragraph

If designed accordingly, recharge pond freezing may be acceptable. The effectiveness of the North Bog in recharging water has not been destroyed due to freezing.

15. Page 17, first complete sentence

This statement is not correct. Evaporation, and possibly freezing, will occur from deep recharge ponds.

16. Page 18 and 19, Activated Carbon Adsorption

An editing problem exists in this section. Beginning with the second disadvantage listed on page 19, the text switches to a partial discussion of air stripping, not carbon adsorption. The more complete discussion of air stripping, apparently intended, is missing.

17. Page 19, second paragraph

It is the opinion of Shell that air stripping should be removed from further consideration unless it can be demonstrated that it is economically viable.

18. Page 27, Section 6.0

Before a decision is made to implement an extraction system along the First Creek plume, a more thorough and meaningful assessment of the need for the system should be made. This assessment should include an evaluation of the distribution of the contaminants of concern in the First Creek area.

19. Page 28, Section 6.2

This IRA shold include the current program of supplying bottled water to residents utilizing the Boller well in Section 12.

20. Page 29, first full paragraph

The statement that "recharge by wells is expected to be significantly more cost-effective than recharge utilizing subsurface drains" seems contradictory to experience gained at the North Boundary Containment System. It is true that clogging may be a problem with subsurface drains. However, it is a demonstrated significant problem in wells. As stated in Section 4.2.2.2, "When practical, other recharge methods are generally preferred over recharge wells because of the high cost, tendency for plugging, and relatively high maintenance costs of recharge wells". Site-specific conditions and requirements should be evaluated before selections of recharge wells or subsurface drains are made.

21. Page 30, first paragraph

Fluoride is mentioned as an inorganic species of concern, yet no assessment of the need to address fluoride levels is included.

SHELL OIL COMPANY COMMENTS
ON THE
PROPOSED DECISION DOCUMENT FOR THE
GROUNDWATER INTERCEPT AND TREATMENT SYSTEM
NORTH OF ROCKY MOUNTAIN ARSENAL

1. Page 1, first paragraph

COMMENT

The introduction should note that the Army committed to a groundwater intercept and treatment system in a letter to the Colorado Department of Health dated August, 1988.

RESPONSE

The text has been revised in response to this comment.

2. Page 1, second paragraph

COMMENT

According to Section 6.0, this IRA also includes a groundwater monitoring program and an alternative water supply program.

RESPONSE

The text has been revised in response to this comment.

3. Page 3, number 1

COMMENT

The First Creek and Northern Paleochannels are the primary pathways for offpost migration north of the RMA boundary, not across the boundary.

RESPONSE

The text has been modified in response to this comment.

4. Page 3, number 2

COMMENT

Although this statement is correct, it should be also noted that most of the contaminants of concern have not even been detected downgradient of the O'Brian Canal.

RESPONSE

The Army agrees with the comment, but does not believe revisions to the document are necessary.

5. Figure 2-2

COMMENT

The primary groundwater flow path towards the North Boundary Containment System does not go through Section 23 as implied by the location of the arrow on the figure. A much larger groundwater flow migrates towards the boundary system through Section 24, near First Creek.

RESPONSE

The figure has been modified in response to this comment.

6. Figure 2-3

COMMENT

This map shows large areas covered with groundwater contamination where data are not available to support the supposition. This map is consequently misleading. Presenting the maps included in the RI showing the contaminants of concern would be much more informative. For example, examining these RI maps shows that only a few of the contaminants identified on Figure 2-3 have been identified in the so-called First Creek plume, and even these contaminants have been found in only a few, widely scattered wells. Hence, indication of contaminant plumes is inappropriate based on the very limited data.

RESPONSE

This figure has been developed based on a compilation of individual plume maps from the RI. The text has been revised to indicate the generalized nature of the figure and states that the RI report contains individual plume maps from which this figure was developed.

7. Page 8, first line

COMMENT

Shell is not aware of any areas in which First Creek receives flow from Denver Formation groundwater, as stated, except indirectly by way of the alluvial aquifer.

RESPONSE

The text has been modified to clarify that water from the Denver Formation does not directly recharge First Creek.

8. Page 8, first full paragraph

COMMENT

It would be appropriate to explain where First Creek flows go when they exceed the capacity of the O'Brian Canal.

RESPONSE

All surface flows in First Creek flow into O'Brian Canal, no diversion structures are present along First Creek. No revision to the document is necessary.

9. Page 9, Section 2.2, line 6

COMMENT

The First Creek plume reaches the O'Brian Canal in central Section 14.

RESPONSE

The text has been revised in response to this comment.

10. Page 9, Section 2.3

COMMENT

A list of chemicals detected within the study area is provided, but the basis of this listing is not discussed. It is suspected that, in some cases, questionable or "suspect" analytical data was used to prepare this listing.

RESPONSE

The list of chemicals has been compared to and made consistent with the appropriate sections of the RI and EA/FS. In most cases, data have been confirmed over at least three different sampling periods.

11. Page 13, first paragraph (and Section 4.1)

COMMENT

The proposed Consent Decree states that a groundwater intercept and treatment system north of the RMA should be assessed, but does not state that it must be implemented. Shell recognizes that the proposed Federal Facility Agreement would require the implementation of this system.

RESPONSE

Appropriate revisions have been made to the document.

12. Page 14, last two sentences of first partial paragraph

COMMENT

Several factors, such as volatility, concentration, and rate of uptake of the contaminant, would have to be considered before a decision is made that bathing is a potential route of exposure. This issue should be discussed in a meeting of the parties before any decision if made.

RESPONSE

The specific reference to bathing has been deleted from the document.

13. Page 14, first partial paragraph

COMMENT

Combinations of the various alternatives may be the most cost-effective way of supplying alternative water sources. For example, some homes may be most economically connected to an existing municipal water supply, while others may be more economically served with installation of a deep well.

RESPONSE

The text has been revised to indicate that one or more of the various alternatives will likely be selected and that such a determination will be made on a case-by-case basis.

14. Page 16, last paragraph

COMMENT

If designed accordingly, recharge pond freezing may be acceptable. The effectiveness of the North Bog in recharging water has not been destroyed due to freezing.

RESPONSE

The appropriateness of ponds for recharging will be evaluated in the design phase.

15. Page 17, first complete sentence

COMMENT

This statement is not correct. Evaporation, and possibly freezing, will occur from deep recharge ponds.

RESPONSE

This discussion has been deleted from the document.

16. Page 18 and 19, Activated Carbon Adsorption

COMMENT

An editing problem exists in this section. Beginning with the second disadvantage listed on page 19, the text switches to a partial discussion of air stripping, not carbon adsorption. The more complete discussion of air stripping, apparently intended, is missing.

RESPONSE

The text has been revised in response to this comment.

17. Page 19, second paragraph

COMMENT

It is the opinion of Shell that air stripping should be removed from further consideration unless it can be demonstrated that it is economically viable.

RESPONSE

Economic viability will be considered in the design phase of the IRA. No revision to the document is necessary.

18. Page 27, Section 6.0

COMMENT

Before a decision is made to implement an extraction system along the First Creek plume, a more thorough and meaningful assessment of the need for the system should be made. This assessment should include an evaluation of the distribution of the contaminants of concern in the First Creek area.

RESPONSE

The Army is currently developing a work plan for further assessing the extent of contamination along the First Creek and Northern Paleochannels. The results of this assessment, which includes collecting additional hydrogeologic and ground-water chemistry data, will be used to determine the need for and design of any individual intercept and treatment system(s) along both paleochannels. The Army intends to address both plumes in the implementation of this IRA, but may do so through use of a single treatment system, if appropriate. This plan will be distributed to the Organizations for comment.

19. Page 28, Section 6.2

COMMENT

This IRA should include the current program of supplying bottled water to residents utilizing the Boller well in Section 12.

RESPONSE

The document has been revised in response to this comment.

20. Page 29, first full paragraph

COMMENT

The statement that "recharge by wells is expected to be significantly more cost-effective than recharge utilizing subsurface drains" seems contradictory to experience gained at the North Boundary Containment System. It is true that clogging may be a problem with subsurface drains. However, it is a demonstrated significant problem in wells. As stated in Section 4.2.2.2, "When practical, other recharge methods are generally preferred over recharge wells because of the high cost, tendency for plugging, and relatively high maintenance costs of recharge wells". Site-specific conditions and requirements should be evaluated before selections of recharge wells or subsurface drains are made.

RESPONSE

As stated at the end of the last paragraph of Section 6.3, "The final configuration of the extraction and recharge system, including the number and locations of wells or drains, will be based on additional investigations and will be presented in future design documents." No revisions to the document are necessary.

21. Page 30, first paragraph

COMMENT

Fluoride is mentioned as an inorganic species of concern, yet no assessment of the need to address fluoride levels is included.

RESPONSE

Based on available data contained in the EA, Fluoride is no longer a contaminant of concern. Based on these results, the Army does not believe that Fluoride will exceed the MCL; however, if that occurs, it can be addressed through the Offpost ROD or by modification of the IRA Treatment System.

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Edward J. McGrath

February 3, 1989

Mr. Donald Campbell
Office of the Program Manager
for Rocky Mountain Arsenal
Attn: AMXRM-PM/Mr. Donald Campbell
Rocky Mountain Arsenal, Building 111
Commerce City, Colorado 80022-2180

Re: Shell Comments on Offpost IRA Potential ARARs

Dear Mr. Campbell:

This letter includes the comments of Shell Oil Company ("Shell") with respect to the potential ARARs set forth in the following documents:

(1) Offpost Interim Response Action Alternatives Assessment, Draft Final Report (Version 2.3), December 1988 (the "Alternatives Assessment"); and

(2) Proposed Decision Document for the Ground-Water Intercept and Treatment System North of Rocky Mountain Arsenal, December 1988 (the "Decision Document").

General Comments

By a letter to Mr. Charles Scharman dated June 21, 1988, Shell submitted comments on the Interim Response Action North of RMA Draft Applicable or Relevant and Appropriate Regulations Document dated May 20, 1988. The potential ARARs listed in Appendix A of the Alternatives Assessment and Appendix A of the Decision Document are virtually identical to the potential ARARs listed in Appendix H of the draft final report on the Offpost Remedial Investigation (the "Offpost RI"). By a letter to you dated November 11, 1988, Shell submitted comments on the potential ARARs for the Offpost RI. Shell hereby reiterates and incorporates by reference all

these previously submitted comments, except to the extant that they have already been adopted in the Alternatives Assessment and the Decision Document.

Although the medium of concern for this IRA is contaminated alluvial groundwater, ARARs are listed for air, surface water, and biota. Some explanation should be given for listing ARARs for those media.

The formulas for determining 24-hour averages for AWQCs contain a typographical error. "In" should be replaced by "ln." This error is found under the potential ARARs for cadmium, chromium III, chromium VI, copper, copper sulfate, lead, and zinc oxide.

Shell questions the listing of TPFA and TRCRAC tolerances & residues as potential ARARs. For example, a potential ARAR is listed for surface water and groundwater on the basis of an exemption from the tolerance for xylene when it is used as an aquatic herbicide, provided that certain conditions are met, one of which is set forth in Appendix A. The limitation cited, however, is specific to the use of xylene as an aquatic herbicide where irrigation water containing xylene residues is used as a source of raw water for potable water supplies. To the best of our knowledge, irrigation water is not used either onpost or offpost for drinking water supply purposes.

In the case of endrin, the tolerances are established for specific agricultural commodities. It is not clear how the tolerances for endrin as may be used a a potential biota ARAR.

A tolerance for copper as a food additive permitted in food for human consumption is established at 1 ppm in potable water for residues of copper resulting from the use of copper compounds as algicides and herbicides. However, the regulations provide an exemption from the requirement of a tolerance for copper in meat, irrigated crops, and other specified foods resulting from the use of copper as an algicide or herbicide in impounded and stagnant bodies of water, lakes, ponds, and reservoirs.

A tolerance is also listed for inorganic bromide residue in certain foods "when the food additive is the result of fumigation of the processed food with methyl bromide or from such fumigation in addition to the authorized use of methyl bromide or the nematocide 1,2-dibromo-3-chloropropane on the source raw agricultural commodity . . .." 40 C.F.R. § 193.250(a). This regulation applies to the total residues

of inorganic bromides in or on processed foods such as dried eggs, Parmesan cheese, concantrated tomato products, etc. In the case of DBCP contamination from RMA, it is difficult to conceive of the presence of inorganic bromides, and hence the application of a tolerance for inorganic bromides in processed foods as a potential biota ARAR.

Specific Comments--Alternatives Assessment

Page 5, 2d ¶, last line; and page 6, 3d ¶, 3d line - Delete "potential." Paragraph 9.7 of the proposed Consent Decree requires that IRAs attain ARARs, not potential ARARs, to the maximum extent practicable. A potential ARAR is one that has not yet been, and may never be, selected.

Page 6, 4th ¶ - The third sentance ("These potential ARARs are listed in Appendix A and will constitute the cleanup goals for the IRA.") is incorrect. The potential ARARs may constitute cleanup goals, but then again they may not. Before a potential ARAR can become a cleanup goal, it must be selected.

The fourth sentance also appears premature. If detection limits are really being selected by the Alternatives Assessment, the Army must specify which detection limits are selected, since they may differ depending upon the method or laboratory used. More fundamentally, however, Shell questions the logic behind using detection limits as cleanup goals for chemicals for which there are no ARARs. Are such low levels really necessary to protect human health and the environment--especially when there is no human consumption of the groundwater to be treated by this IRA (see, e.g., p. 17)? In no event, however, should a cleanup goal be lower than the natural background level. In the absence of ARARs, Shell would prefer the use of values based on quantitative risk analysis.

Specific Comments--Decision Document

Page 33, 3d ¶ - The words "In this instance," suggest that the letter of February 5, 1988 was the manner in which participation in identification and selection of ARARs on the RMA Committee level occurred. As the letter dated March 7, 1988, from David L. Anderson to Edward J. McGrath, makes clear, such requests for "early submission of ARAR suggestions were made in addition to, rather than in lieu of, the ARAR selection process detailed in the RI/FS Process Document."

Page 36, 1st ¶ - Paragraph 23.2 of the proposed Consent Decree lists certain existing restrictions on the use

of resources on and under the Arsenal. Because this IRA will be conducted north of the Arsenal boundaries, Shell does not understand the relevance of the discussion of paragraph 23.2(e) and (f). In any event, the language attributed to paragraph 23.2(f) is from the proposed Consent Decree filed with the Court February 1, 1988, rather than the more current version cited on page 43 of the Decision Document.

Page 37, 2d ¶ - To avoid confusion, the text should explain that rules under OSHA are not ARARs, as defined in section 121(d) of CERCLA.

Page 37, 1st ¶ - The last sentance states that if air stripping equipment is later added, NESHAPs will have to be considered as potential ARARs. The only NESHAPs listed in Appendix A, however, are for arsenic, arsenic chloride, arsenic trioxide, and mercury. Because these inorganic chemicals will not volatilize from groundwater, they will not result in any air emissions even if air stripping is used.

Page 37, last ¶ - Add "more" before "than one (1)."

Specific Comments--Appendix A

32. 1,2-Dichloroethylene - 45 Fed. Reg. 79,332 (1980), which is cited as authority for the AWQC, states that "Using the present guidelines, a satisfactory criterion cannot be derived at this time due to the insufficiency in the available data for 1,2-dichloroethylene."

34. Dieldrin - The Potential Surface Water ARAR summarized under (c) should read ". . . concentration should not exceed 2.5 ug/l . . .."

64. 1,1,2,2-Tetrachloroethylene - The correct page number for the 840 ug/l standard is 79,340.

Miscellaneous Comments

Shell supplements its previously submitted comments on the Alternatives Assessment and the Decision Document by adding the following additional comments:

Alternatives Assessment

Page 1, 1st ¶, 2d line - Replace "Offpost Operable Unit of" with "Groundwater Intercept and Treatment System IRA for."

Page 2, 3d ¶ - The use of "Parties and State (PAS)" is incorrect. "Parties" means the U.S. and Shell. The

appropriate term is "the Organizations," which includes the State.

Page 3, 1st ¶ of 1.1, last sentence - The Arsenal was listed on the NPL in late 1987.

Page 4, last ¶, 7th line - Mention should also be made of the revised NCP, published in the Federal Register on December 21, 1988, in addition to the reference to 40 C.F.R. §§ 300.6 and 300.65.

Decision Document

Page 1, 1st ¶, 3d line - Replace "matter in" with "report to the court in."

Page 2, 1st ¶ - The Arsenal was listed on the NPL in late 1987.

Page 41, last sentence - Because implementation of IRAs is governed by the proposed Consent Decree, rather than the RI/FS Document, replace "the discussion in Section XVII of the process Document" with "Section XVIII of the proposed consent Decree."

Very truly yours,

Edward J. McGrath

EJM:cg
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SHELL COMMENTS ON OFFPOST IRA POTENTIAL ARARs

GENERAL COMMENTS

The first few pages of comments by Shell are general comments that pertain to the potential ARARs included in the Proposed Decision Document.

RESPONSE

Based on the comments received, this section has been substantially rewritten.

SPECIFIC COMMENTS -- DECISION DOCUMENT

Page 33, 3d paragraph. The words "In this instance", suggest that the letter of February 5, 1988 was the manner in which participation in identification and selection of ARARs on the RMA Committee level occurred. As the letter dated March 7, 1988, from David L. Anderson to Edward J. McGrath, makes clear, such requests for "early submission of ARAR suggestions were made in addition to, rather than in lieu of, the ARAR selection process detailed in the RI/FS Process Document."

RESPONSE

This section was substantially revised in response to the comments received from all the parties.

Page 36, 1st paragraph. Paragraph 23.2 of the proposed Consent Decree lists certain existing restriction on the use of resources on and under the Arsenal. Because this IRA will be conducted north of the Arsenal boundaries, Shell does not understand the relevance of the discussion of paragraph 23.2(e) and (f). In any event, the language attributed to paragraph 23.2(f) is from the proposed Consent Decree filed with the Court February 1, 1988, rather than the more current version cited on page 43 of the Decision Document.

RESPONSE

This section was substantially revised in response to the comments received from all the parties.

Page 37, 2d paragraph To avoid confusion, the text should explain that rules under OSHA are not ARAR's, as defined in section 121(d) of CERCLA.

RESPONSE

This section was substantially revised in response to the comments received from all the parties.

Page 37, 1st paragraph The last sentence states that if air stripping equipment is later added, NESHAPs will have to be considered as potential ARARs. The only NESHAPs listed in Appendix A, however, are for arsenic, arsenic chloride, arsenic trioxide, and mercury. Because these inorganic chemicals will not volatilize from groundwater, they will not result in any air emissions even if air stripping is used.

RESPONSE

This section was substantially revised in response to the comments received from all the parties.

SPECIFIC COMMENTS -- APPENIDIX A

RESPONSE Appendix A has been deleted from the document.

MISCELLANEOUS COMMENTS -- DECISION DOCUMENT

Page 1, 1st paragraph, 3rd line. Replace "matter in" with "report to the court in".

RESPONSE Appropriate revisions have been made to the document.

Page 2, 1st paragraph. The Arsenal was listed on the NPL in late 1987.

RESPONSE Appropriate revisions have been made to the document.

Page 41, last sentence. Because implementation of IRAs is governed by the proposed Consent Decree, rather than the RI/FS Document, replace "the discussion in Section XVII of the process document" with "Section XVIII of the proposed consent Decree."

Response: The phrase has been changed to "...Section XXII of the Federal Facility Agreement."

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Ref: 8HWM-SR

FEB 3 1989

Mr. Donald L. Campbell
Office of the Program Manager
Rocky Mountain Arsenal
ATTN: AMXRM-PM
Commerce City, Colorado 80022-2180

Re: Rocky Mountain Arsenal (RMA)
Offpost Interim Response Action
Draft Final Decision Document and
Offpost Interim Response Action
Alternatives Assessment Draft Final
Report, December 1988.

Dear Mr. Campbell:

Since the two above referenced documents apply to the same Interim Response Action, we have reviewed them concurrently and submit the enclosed comments pertinent to each of these documents. A meeting should be scheduled to further discuss these issues. Please contact me at (303) 293-1528, if you have questions on this matter.

Sincerely,

Connally Mears
EPA Coordinator
for Rocky Mountain Arsenal Cleanup

Enclosure

cc: Thomas P. Looby, CDH
David Shelton, CDH
Patricia Bohm, CAGO
Lt. Col. Scott P. Isaacson
Chris Hahn, Shell
R. D. Lundahl, Shell
David Anderson

Since both documents were provided contemporaneously, comments provided below (unless otherwise specified) are pertinent to both.

ARAR ANALYSIS:

As a general matter, the ARAR analysis in both documents is incomplete, improperly utilized and therefore unacceptable for the reasons stated below:

As set forth in Paragraph 9.7 of the proposed Consent decree, ARAR analysis is an integral part of the IRA Alternative Assessment and alternative selection. This is because ARAR analysis is an indispensable and significant aid in analysis of the IRA alternatives and the selected alternative under the criteria set forth in Paragraph 9.6 of the proposed Consent Decree. For instance, evaluation of the IRA alternatives for protection of human health and environment (see Paragraph 9.6) will in large part depend upon the attainment of ARARs, particularly chemical specific ARARs or health based protectiveness levels. Likewise, technical feasibility (see paragraph 9.6) may in large part depend upon or ultimately be driven by the attainment or difficulty in attaining ARARs- particularly action specific ARAR's which may dictate the use of or non use of a particular technology. Of course cost (see paragraph 9.6) will greatly be impacted by the requisites of ARAR attainment, particularly action specific ARAR's which direct how a particular response action must be undertaken.

Therefore, an alternative assessment must make an initial evaluation of all types of ARARs which may be pertinent to alternatives under evaluation. Insofar as the proposed Alternative Assessment fails to do so (particularly regarding action specific ARARs) it is impossible to properly evaluate the alternatives under the criteria set forth in paragraph 9.6 of the Consent Decree. Thus, at least an initial analysis of the potential and pertinent ARARs (particularly action specific ARARs) for proposed alternatives must be conducted in the context of the alternative assessment. If the Army chooses to include "option" subsets in both the alternatives evaluated or the preferred alternative, EPA would require that at the very least ARAR groups be developed for the various permutations possible given different combinations of "options" within the alternative evaluated.

On June 22, 1988, EPA submitted detailed comments on the Army's proposed ARARs for this IRA. Many of the comments and concerns raised in those comments remain. Therefore, EPA requests that the Army analyze and respond to all comments (particularly EPA's comments concerning ARARs) and adequately incorporate these comments into both the Assessment and Decision

Document so that those concerns need not be reiterated herein. Needless to say until EPA's comments are addressed or discussed, EPA is not prepared to finalize comments on either the alternative assessment or the Decision Document.

Neither document undertakes a complete analysis of whether the ARARs to be considered are either "applicable" or "relevant and appropriate". Therefore, both documents are flawed in their analysis. As set forth in the OSWER Directive #9234.1-01 such analysis is a required component to ARAR analysis and must be incorporated. Based upon the above discussion concerning general problems with the ARAR analysis contained within both the alternative analysis and the Decision Document, EPA is suggesting a complete revision to the ARAR portions of both documents. OSWER Directive #9234.1-01 CERCLA COMPLIANCE WITH OTHER LAWS MANUAL should be utilized in that revision. In particular, EPA would suggest utilization of the tables set forth at pages 1-16 through 1-23, and 1-31 through 1-54 in order to organize and analyze all potential ARAR's in an appropriate manner.

In addition to EPA's June 22, 1988, comments on the Draft ARAR analysis, we have the following additional specific comments, questions, and concerns which should be considered in revisions of the ARAR analysis:

Although EPA generally endorsed the use of MCL's and AWQC's as chemical specific ARARs for groundwater remediation standards, EPA is unable to endorse or accept the analysis at page 34 of the proposed Decision Document. Although the analysis at page 34 may be appropriate for groundwater remediation standards (if the rationale is explained and clarified), the ARAR analysis does not apply to the alternative water supply component of this IRA.

No explanation is provided as to the basis, for or the protectiveness of, the procedure set forth at page 34 paragraph 3. The "use of AWQC's adjusted for drinking water only" is unclear as to the intent and rationale for such an approach which may very well be unacceptable to the EPA if surface water bodies are affected by this IRA or impacted by implementation.

Other potential ARARs may include the Statewide Organic Standards currently being developed by the Colorado Department of Health, if and when promulgated. A consensus has been reached with the majority of the interested parties, and it is very likely that the Water Quality Control Commission will adopt the regulations in March 1989. EPA has also proposed a number of MCLs which will likely need to be included as potential ARARs (reference: 53 Federal Register 31571 (1988)).

As evidenced by other pump, treat, and reinjection operations, such activities do have the potential and often do affect surface water systems. Neither the Alternative Assessment nor the Decision Document address this potential problem nor do

the chemical or particularly the action specific ARARs analysis contain considerations for such effects. Of particular relevance would be consideration of potential ARAR's contained at 40 CFR 6.302, 40 CFR 230, 33 CFR 320-330, and 40 CFR Part 6.

Given that one option within the treatment component of the IRA includes use of extraction and reinjection wells, the lack of a complete evaluation of UIC standards particularly those embodied in 40 CFR 144 et.seq. is unacceptable. Likewise, given that one option retained in the treatment component includes possible use of air stripping, a complete evaluation of air media ARARs will be required.

The Decision Document correctly indicates that the "land ban" provisions of RCRA Section 3004 may be implicated by this IRA. However, such restrictions may be implicated not only regarding handling of soils, but also regarding reinjection of groundwater. While guidance is currently being developed regarding these matters, it is imperative that the regulations promulgated to date under 40 CFR 268 be evaluated and that current guidance be considered. Because of the complexity of issues associated with the land ban EPA requests that a meeting be scheduled with all the parties to discuss those land ban implications and constraints.

Therefore, all of the above will need to be addressed before EPA can endorse the chemical specific ARAR analysis. EPA would again refer to comments provided on June 22, 1988 regarding proposed ARARs.

Appendix A ARARs

PRIMARY NAME: Chloride. There is no potential groundwater ARAR listed for chloride. The National Secondary Drinking Water Standard under 40 CFR 143.3 is 250,000 ug/l or 250 mg/l. This standard should be considered.

PRIMARY NAME: Chlorinated Phenol. The proposed standard proposed by CDH in the Organic Standards for Groundwater is 700 ug/l based on the IRIS database. The AWQC, proposed as the ARAR, is 2600 ug/l which is nearly four times greater.

PRIMARY NAME: Chlorobenzene (Monochlorobenzene). The EPA proposed MCL (53 F.R. 315711, 1988) is 100 ug/l which is approximately five times less than the AWQC proposed as the ARAR at 488 ug/l.

PRIMARY NAME: Chromium III. Why is the chromium III ARAR based on the AWQC and chromium and chromium VI based on the NPDW MCL? These should probably be consistent. Also, the reference for chromium VI (item 22) is incorrect for the number listed.

PRIMARY NAME: Copper. The National Secondary Drinking Water Regulations 40 C.F.R. 143.3 for copper the standard is 1mg/l (1,000 ug/l). The proposed MCL for copper is 1.3 mg/l (53 F.R. 3157. 1988).

PRIMARY NAME: DBCP. The EPA proposed MCL (referenced above) is 0.2 ug/l. This standard is also consistent with the ARAR proposed by the Army in the Proposed Decision Document for the North Boundary System Improvement IRA and should be repeated here.

PRIMARY NAME: Ethylbenzene. The MCL proposed by EPA (53 F.R. 3157, 1988) is 700 ug/l and the CDH proposed Organic Standard for Groundwater is 680 ug/l. These standards are about one-half the value of the ARAR proposed and should be considered, when promulgated.

PRIMARY NAME: Nitrite. The EPA proposed standard (referenced above) is 10,000 ug/l.

PRIMARY NAME: Sulfate. The Secondary National Primary Drinking Water Standard for sulfate is 250,000 ug/l and should be referenced as an ARAR.

PRIMARY NAME: Tetrachlorobenzene. The ARAR proposed is three times higher than the detection level, which is the standard proposed in the CDH Organic Standard (10 ug/l).

PRIMARY NAME: 1,1,2,2-Tetrachloroethane. The proposed CDH Organic Standard for groundwater is 0.2 ug/l and the detection standard is 10 ug/l.

PRIMARY NAME: 1,1,2,2-Tetrachloroethylene. The EPA and CDH proposed standards are 5.0 ug/l.

PRIMARY NAME: Toluene. The EPA proposed MCL is 2,000 ug/l and the CDH proposed Organic Standard is 2,420 ug/l.

The Notes on the groundwater and soils ARARs should reflect that three (not all) other trihalomethanes are included in the total combined limit.

SPECIFIC COMMENTS ON THE DRAFT FINAL DECISION DOCUMENT FOR THE OFFPOST GROUNDWATER INTERCEPT AND TREATMENT SYSTEM INTERIM RESPONSE ACTION

The text of the Decision Document (at page 34) should be modified where it states at one point that "The Army intends, to the maximum extent practicable, to attain the groundwater ARARs [listed in app.A] and then in the next paragraph states "It cannot be determined at this time if every identified ground water ARAR can be attained by this IRA". An approach consistent

with prior Decision Documents should be adopted, including compliance at the point of reinjection.

Page 34 of the Decision Document states that the ARAR's listed in Exhibit A will be met to the maximum extent practicable. Exhibit A contains a list of numerous compounds including numerous inorganics. The document should state that an ARARs analysis of inorganics was provided in the event that future analyses indicates the need for addition of inorganic treatment.

We note that previous analysis of this IRA including ARAR analysis assumed a "useful" life of the system proposed of 7 years. Page 28 of the document indicates that the useful life has been shortened to 5 years. Why?

1. Page 9, Section 2.2, chemical evidence suggests that contamination has spread past O'Brian Canal. In light of this, expand the text to further justify the study area boundaries.

2. Section 4.2. Treatment Options. It should be pointed out that the plume in this area contains high fluoride levels. If the new treatment system creates an effluent which exceeds the MCL for fluoride at the point of reinjection, it may be necessary to provide removal for this compound. Possible need for such treatment should be kept in mind when examining the options.

3. There is no discussion of Air Stripping under the treatment options. This option should be considered and included in this section.

4. On page 34 of the document, it is stated: "It can not be determined at this time if every identified groundwater ARAR can be attained by this IRA, consistent with the goal of rapid implementation. If subsequent data developed in the implementation of this IRA identifies ARARs not being attained, further action will be considered to improve this IRA or address the compound in the final response action." The language should be modified to be consistent with that used in the Basin A Neck Draft Final Decision Document, pages 29 and 30, where it is stated that the Army anticipates the "identified standards, requirements, criteria or limitations" selected as ARARs will be achieved at the point of reinjection. Also, the approach used in the Basin A Neck Decision Document for inorganics (refer to page 32) should be employed for this IRA.

SPECIFIC COMMENTS ON THE OFFPOST INTERIM RESPONSE ACTION ALTERNATIVES ASSESSMENT DRAFT FINAL REPORT

The ARAR analysis in this document does not address action specific ARARs, which as set forth above is a crucial component to be considered in evaluating the alternatives and the

technological options contained therein. As set forth above, the chemical specific ARAR analysis is unacceptable.

Page 6 states that for chemicals (targets or all?) for which there are no ARARs, "detection limits" will be used for clean up goals. As we established in the hydrazine IRA and as we stated in our June 22, 1988, comments on the initial ARAR analysis for this IRA, this is an unacceptable approach.

The document is incorrect at page 4 when it states that this is a ramoval action and will be carried out in accordance with Section 104 of CERCLA.

The document is incorrect at page 5 where it states that the schedule for completion of the IRA is in the TPP. As required by the Consent Decree the completion deadlines are to be defined in the IRA process.

We note that the recommended alternative set forth at page 37 is more specific than the chosen alternative in the Decision Document. The text should be revised to attain consistency between the two documents.

The analysis of alternatives does not attempt to compare the various alternatives to each other under the criteria set forth in paragraph 9.6 of the Consent Decree. Further, the document fails to evaluate and explain the selection of the recommended alternative based on these same criteria.

1. Section 6.1.4, Treatment Options. Air stripping is suggested as a possible option. The document makes no recognition of potential ARARs or the potential cost for controlling emissions from the air stripper. The Colorado Air Pollution Control Regulation # 3 is a potential ARAR which would require reasonable control technology (RACT), and other such ARARs should be assessed as well.

2. Page 15, Section 2.4. It is unclear why this section is included in the report, given that the treatment alternatives appear to not be based on the list of contaminants of concern presented here. On page 36, for example, treatment options are discussed with respect to their ability to remove "organic chemicals". It is recommended that this section be deleted or that the text be expanded to fully explain both the list of contaminants of concern presented and the relevance of this list.

3. Page 17, Section 4.0, paragraph 2. The statement that no imminent threat to human health exists as a result of consumption of contaminated groundwater needs to reflect the uncertainties, pending completion of both the ongoing Tri-County Health Department well use survey and further sampling. In addition, the EPA would like additional off-post wells to be contained in

the CMP, as discussed in EPA's comments on the Draft Final CMP Technical Plan.

4. Page 33, Section 6.1.3. The text indicates that a conceptual design flow of 300 gpm was used to develop alternatives for the ground water extraction and recharge options. Results from aquifer pumping tests conducted in the Off-Post IRA study area, (Off-Post CAR, pages 12-14), suggest that hydraulic conductivity values may be an order of magnitude higher than the values given by the slug test data, implying that the system fluxes could be considerably higher than given. It is understood that the 300 gpm value represents an approximate flux used for costing purposes only; however, the hydraulic and hydrogeologic inputs from which this estimate was made need to be included to evaluate the likely effectiveness and cost of the proposed alternatives.

5. Page 35, Section 6.1.3.2. The effectiveness of recharge wells compared to trenches or drains should be reevaluated. Due to present problems associated with recharging 250-300 gpm with wells at the North Boundary Containment System (NBCS), the Army has determined in both the NBCS Trenches IRA Decision Document and the NBCS Component Response Action Assessment that recharge trenches are the preferred alternative. The total off-post flux of 300 gpm could represent an underestimate, which would make recharge of treated water through wells even less effective. The text should be modified to include a discussion of these issues.

6. Page 37, Section 6.2. The EPA agrees that any alternative selected for the Off-Post IRA should incorporate ground water monitoring, alternative water supply and ground water extraction, treatment and recharge. We feel, however, that well head treatment should be the preferred alternative water supply since it would eliminate, with minor additional cost, potential routes of exposure such as bathing and garden irrigation that supply of bottled water would not. The Army's preference for the bottled water supply program or the installation of a central supply well are not necessarily the most cost-effective alternatives for meeting the objectives of the IRA and warrant modification or additional justification.

7. Page 17, expand the text to explain the trigger for provision of an alternate drinking water supply to the affected households. What chemicals will be monitored and compared against what ARARs?

8. Page 17, in light of the recently discovered contamination concerns along 96th Avenue, the text should be revised in regard to the surface water and soil not being a media of concern. It should also reflect that these are newly-discovered circumstances and thus were not defined as part of this IRA.

U.S. EPA SPECIFIC COMMENTS ON THE DRAFT FINAL DECISION DOCUMENT FOR THE OFFPOST GROUNDWATER INTERCEPT AND TREATMENT SYSTEM INTERIM RESPONSE ACTION

COMMENT: The first five pages of EPA comments are general comments concerning ARARs.

RESPONSE:

EPA provided significant comments concerning the proposed ARARs. The Army has reviewed these comments and substantially revised the ARAR section to address the matters raised by EPA. The Army was provided the guidance document cited by EPA in these comments, OSWER Dir. 9234.1-01, August 8, 1988 Draft, on February 22, 1989 and believes the revised ARAR section is not inconsistent with this current guidance. The revised document selects specific standards to be met at the point of reinjection. Proposed standards are not selected as ARARs as they are not final. The Army understands the ARAR process to be dynamic and will reevlauate selected standards for specific contaminants in the event a more stringent standard is promulgated as a final standard by an appropriate State or Federal regulatory agency.

COMMENT: The text of the Decision Document (at page 34) should be modified where it states at one point that "The Army intends, to the maximum extent practicable, to attain the ground water ARARs (listed in app. A) and then in the next paragraph states "It cannot be determined at this time if every identified ground water ARAR can be attained by this IRA". An approach consistent with prior Decision Documents should be adopted, including compliance at the point of reinjection.

RESPONSE:

The text of the Decision Document has been substantially revised. Appendix A has been deleted.

COMMENT: Page 34 of the Decision Document states that the ARAR's listed in Exhibit A will be met to the maximum extent practicable. Exhibit A contains a list of numerous compounds including numerous inorganics. The document should state that an ARARs analysis of inorganics was provided in the event that future analyses indicates the need for addition of inorganic treatment.

RESPONSE:

The text of the Decision Document has been substantially revised. Appendix A has been deleted.

COMMENT: We note that previous analysis of this IRA including ARAR analysis assumed a "useful" life of the system proposed of 7 years. Page 28 of the document indicates that the useful life has been shortened to 5 years. Why?

RESPONSE:

The estimate of the useful life of the system is related to the anticipated implementation of the Record of Decision for the Offpost Operable Unit.

COMMENT 1. Page 9, Section 2.2.

Chemical evidence suggests that contamination has spread past O'Brian Canal. In light of this, expand the text to further justify the study area boundaries.

RESPONSE:

This section of the Decision Document contains a brief description of the nature and extent of ground-water contamination north of RMA. The study area was defined as described in Section 1.2, Description of Offpost IRA Study Area. As stated in Section 1.2, the study area boundaries have been defined for this IRA based on the following conclusions from the RI report:

1. The First Creek and Northern Paleochannels are the primary pathway for offpost migration of contaminants north of RMA.

2. The highest concentrations of contaminants in the alluvial ground water offpost occurs along these two pathways upgradient of Burlington Ditch and O'Brian Canal.

3. The greatest flux of contaminanats to downgradient areas generally occurs along the axes of the peleochannels, where the saturated thickness of the alluvium is greatest and the contaminant concentrations are highest.

Based on these findings and the IRA objective of initiating ground-water remediation in a timely manner, the IRA study area has been defined to include the First Creek and Northern Paleochannels upgradient of O'Brian Canal. No revision to the document is necessary in response to this comment.

COMMENT 2. Section 4.2.

Treatment options. It should be pointed out that the plume in this area contains high fluoride levels. If the new treatment system creates an effluent which exceeds the MCL for fluoride at the point of reinjection, it may be necessary to provide removal for this compound. Possible need for such treatment should be kept in mind when examining the options.

RESPONSE:

The Army does not believe that Fluoride levels will exceed the MCL. However, if that occurs, it can be addressed through the offpost ROD or by modification of the IRA Treatment System.

COMMENT 3.

There is not discussion of Air Stripping under the treatment options. This option should be considered and included in this section.

RESPONSE:

Air stripping will be evaluated as a possible treatment technology for the organic fraction. The document has been modified to include a discussion of air stripping.

February 6, 1989

Program Manager for
Rocky Mountain Arsenal
Building 111
Rocky Mountain Arsenal
Commerce City, CO 80022-2180

Attention: Donald L. Campbell

Dear Mr. Campbell:

This letter is written in response to public comments on the groundwater intercept and treatment system north of the Rocky Mountain Arsenal IRA.

After reading the available and appropriate information and attending the public meeting held January 17, 1989, we feel compelled to submit the following:

1. Location: We live directly north of the RMA. This location puts us directly north and in line with the storage tanks holding products and by-products from Basin F and approximately one mile from Basin F itself. In short we live approximately one mile from perhaps the "most contaminated area in the world". Without a question, we are concerned and this particular IRA along with past presented IRA's directly involve and affect us.

2. Treatment System: We agree that a definite need exists given the information supplied for an off post water treatment system. The contaminants and contaminated plumes show movement towards and past the north boundary. The question of most concern to me is location of this treatment plant. It was quite apparent and explained quite clearly that not a great amount of land is needed for this project nor any recommendation that residents living directly along East 96th Avenue would be compensated to enable relocation.

We are beginning to feel very much like General George Custer at the Battle of the Little Big Horn. The similarity being he surrounded by Indians and us surrounded by contaminants, both just as deadly. The difference being General Custer chose his battle ground and could readily see his foe. We in our

deadly battle seemingly have few choices and cannot as readily see our foe. We do choose however not to die with our boots on.

3. Health Measures: We believe that these moving contaminants have hurt us significantly already and pose an ongoing threat to our health and well-being. We think that the studies and levels of safe and unsafe are difficult to determine and are not based on cumulative amounts of daily living. We do think that in spite of surveys and studies done that not enough information is available to determine long range effects. We do not wish to fall victims of a survey. We do think that measures can be taken to protect these precious gifts of life and well-being. Protect rather than destroy and study.

4. Interim Measures: We believe that certain measures should be taken during the interim time of plan to completion.

a) A recommendation included on this IRA that residents living along East 96th Avenue from Highway 2 to First Creek be compensated to enable affected residents to relocate. This is based on known movement of contamination towards the north boundary and cumulative unsafe unknown health hazards. We suggest this be extended to include all affected residents on the north boundary. This recommendation is presented as a preventive health measure.

b) Deep well water be tested bi-yearly. We suggest the months of February and August. We ask that these results are available in a 4-6 week period and that the results are complete with values used. We ask that test results are accurate and noted where and by whom testing was done and the name of a reference person residents may contact for further explanation. Furthermore, we ask that results be mailed directly to the appropriate resident.

c) Supplying of bottled water at no cost to residents living along East 96th Avenue from Highway 2 to First Creek until treatment plant is built and operational.

d) Ground sampling continue on a regular basis four (4) times a year based on seasonal changes i.e., winter, spring, summer, autumn. We ask that results be accurate and are available in a 4-6 week period and mailed directly to residents. We ask that included with results is where and by whom testing was done and the name of a reference person residents may contact for further explanation.

e) Air sampling continued with a monthly report sent by mail to area residents. Please include with this report a list of normal values and a reference person residents may contact for further explanation.

f) Public meetings at Stapleton Plaza are continued on a monthly basis.

Albert L. Maul

Evelyn F. Maul
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Thomas J. Smaldone

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DEPARTMENT OF THE ARMY
PROGRAM MANAGER FOR ROCKY MOUNTAIN ARSENAL
ABERDEEN PROVING GROUND, MARYLAND 21010-5401

REPLY TO
ATTENTION OF

April 27, 1989

Remedial Planning Division

Dear Resident:

This letter is in response to your comments on the Proposed Decision Document for the Groundwater Intercept and Treatment System North of Rocky Mountain Arsenal (RMA). Responses to your comments are provided in the same format (i.e. numbered paragraphs) as your letter of February 6, 1989.

I would also like to express my appreciation for your interest in the RMA cleanup efforts and your patience and cooperation in the recent investigation into contamination on and around your property.

The following are responses to your comments:

Comment 1:
Response: We recognize that your homes are located near areas where significant cleanup actions have and will continue to take place. These actions are necessary to return the arsenal environment to conditions where it can be available for open space and public benefit. We also realize, that although these actions may not take place directly on your property, they can have an influence on your lives. This is a significant consideration in determining the manner in which remedial actions are completed at RMA. Please keep in mind that these actions are being conducted to ensure that the environment adjacent to RMA remains safe for residents living in the area. To date we have not identified routes (e.g. drinking groundwater, contacting soil, breathing air, etc.) in which you may be exposed to contaminants at harmful levels. Although contaminants have been detected on and around your properties, the concentrations and the routes through which you could be exposed to these contaminants do not indicate that a health threat exists. This is and will continue to be a requirement that will not be compromised.

Comment 2:
Response: The Army remains committed to cleaning up RMA contamination in both the onpost and offpost environments as soon as possible. We believe the construction of the offpost groundwater treatment system will go a long way toward that goal. The location of the system will be selected to allow for the most timely and efficient cleanup of groundwater in the offpost area. The information that was probably given to you was as follows; due to your proximity to the North Boundary Treatment System, it is not likely that

another system would be located in your immediate area. If groundwater is pumped to the vicinity of 96th Avenue, it is likely that the North Boundary System or an addition to the system would be used to treat the water. Alternatives for the exact location, type and configuration of the groundwater extraction/treatment/reinjection system will be evaluated over the next year and will be discussed with residents prior to selection of a site and final design.

Comment 3:
Response: As previously mentioned, although contaminants have been detected on and around your properties, the concentrations and routes of exposure do not indicate that a health threat exists. A great number of safety factors are incorporated into the health assessments and the most qualified experts in the field stand behind the procedures used to determine risks and acceptable levels of chemicals. These types of evaluations are similar to those conducted to determine the risks of smoking or using other cancer-causing items (e.g. saccharine, peanut butter, etc.).

Comment 4a:
Response: As previously stated, our data collected to date does not indicate that a health threat exists to residents offpost. We are continuing to collect data to insure that a health threat does not arise.

Comment 4b:
Response: We agree that a routine chemical analysis program should be conducted for residents living immediately north of RMA. Based on previous results from samples collected from your wells, the quality of your drinking water is actually quite good. However, to insure that the quality does not change in the future, a full analysis for RMA-related contaminants will be conducted on an annual basis. Additional tests (hardness, conductivity, etc.) will be conducted on a semi-annual basis to monitor potential changes in water quality. By comparing the results of these tests (hardness, etc.) on a semi-annual basis, this provides a good indicator of whether the quality of water could be changing from the time of the last full chemical analysis. If these tests indicate that the water quality may have changed, another analysis (in addition to the annual sample analysis) will be conducted to determine the water quality.

Comment 4c:
Response: As noted in response to Comment 4b., the water quality of drinking water wells along 96th Avenue is quite good. Provision of bottled water is considered a temporary measure for those residents with contamination in their drinking water at levels above EPA guidelines. Bottled water would only be provided until a permanent alternate water source (e.g. deep well, hook-up to SACWSD distribution system) could be provided.

Because your drinking water does not have RMA related contaminants at any level, provision of bottled water or any other alternate water source is not considered necessary. If at any time in the future, chemical analyses from your wells indicate that RMA contaminants are present at levels above EPA guidelines, actions to provide an alternate source of water will be taken.

Comment 4d:
Response: We agree that additional ground sampling is necessary on and around your properties. This sampling will take place at different times throughout the year in attempt to evaluate any seasonal changes that may occur. Plans for the sampling will be fully coordinated with residents along 96th Avenue and First Creek. We also would like to solicit input from residents in an effort to make these programs address your concerns. Data from these programs will be provided directly to the residents as soon as they become available. The data package provided to you will include the information requested in your comments (results, where and by whom sampling was done, and a point of contact for further information). We will attempt to provide the data package within a 4-6 week period; however due to laboratory turnaround time, this may not always be possible.

Comment 4e:
Response: While air sampling is not a part of this IRA, it is part of the ongoing program of monitoring Basin F and will continue. Data from the Basin F monitoring program will be provided directly to the residents as it becomes available, although results may not always be available within a month due to potential laboratory delays. We assume by "normal values" you mean the background levels in ambient air. Background levels can be provided to you with results of the test taken, but it is anticipated that test values will be equivalent to background levels since the Basin F project (including the waste pile cap) has been completed.

Comment 4f:
Response: Public meetings will be held as required for public comment on the various projects at the Arsenal.

Comment 4g:
Response: Comments submitted during public meetings concerning specific projects are addressed in the written response to comments contained in the Draft Final Decision Document. Other written comments received will be addressed individually.

Comment 4h:
Response: See response to comment 4f.

Again, thank you for your interest in the RMA cleanup program. We look forward to continuing to work with you in the future.

Sincerely,

Donald L. Campbell
Deputy Program Manager,
Rocky Mountain Arsenal